

BTL-4000 Series

USER'S MANUAL



BEFORE YOU START

Take a moment to reflect on the advantages of the BTL-4000 Electrical Stimulation, Ultrasound, Laser and Magnet technology in your own clinic. The BTL-4000 system has many benefits not available in other systems. For an example, a choice of therapy protocols offers maximum flexibility in a variety of clinical applications.

The combination electrical stimulation / ultrasound / laser or magnet therapy system also offers substantial benefits since it eliminates the need to purchase separate units. We sincerely believe the latest BTL physiotherapy system is technically superior to any other physiotherapy products available and will provide years of trouble-free and profitable use.

All of us at BTL wish you every success with your BTL-4000 system. We pride ourselves on being as responsive as possible to our customers' needs. Your suggestions and comments are always welcome since we believe an ongoing relationship with our customers is critically important to our future product line. Please call or email us your suggestions.

While we would like you to start using your equipment right away, we encourage you to thoroughly read this manual in order to fully understand the operational features of the BTL-4000 system.

Again, thank you for being a BTL customer. In the event of any problem, or if you require service, please make an initial call to your local distributor, who will decide whether to refer the problem to our office.

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1 GENERAL CHARACTERISTICS

The BTL-4000 Series offers advanced and well designed physiotherapy units for professional use. Depending on the required configuration, each system can consist of up to two units with combinations - for electrotherapy, ultrasound, laser or magnet therapy treatment.

The modular design of the BTL-4000 equipment allows you to build the combination you require. Combine an electrotherapy unit of your choice with either ultrasound, laser or magnet all in a single unit. This can save considerable money in your physiotherapy investment.

Selecting a diagnosis from a list of alphabetically organized treatment protocols, or selecting a program, will make an easy and efficient start of the therapy. Naturally, you can adjust any treatment parameter manually by the simple use of the unit keys and buttons. Throughout the whole therapy, the display informs you about the remaining therapy time, channel and therapeutic method used, the type of therapy applied, attached accessories, and other necessary data.

If several accessories are attached to your unit at the same time, you can easily recognize the accessory required for a specific treatment. Select a treatment on the display (electrotherapy, ultrasound, laser or magnet), and the control light on the corresponding accessory (electrotherapy cable, ultrasound head, or magnet disc / double disc / linear or solenoid applicator) will start blinking to indicate that this accessory should be used.

Save your time by using the pre-programming of the BTL-4000 units. Based on detailed research and practical use of the units, the well-organized pre-programmed protocols will give you recommendations for treating various conditions. The unit also includes up to 50 free lots to define your own protocols. Moreover, you can recall the last 20 treatments.

Prepare your own protocols and later invoke them from easily accessible option.

With every BTL unit, you can purchase a cart specially designed for BTL products. Its versatile design allows you to conveniently store and use 1 or 2 physiotherapy units and a vacuum unit. The cart includes a range of accessory trays and baskets. Four well-built and steady castors ensure easy movement of the unit in the office or hospital.

Please visit our corporate website at <http://www.btl.net.com> for the latest information on BTL products and services.



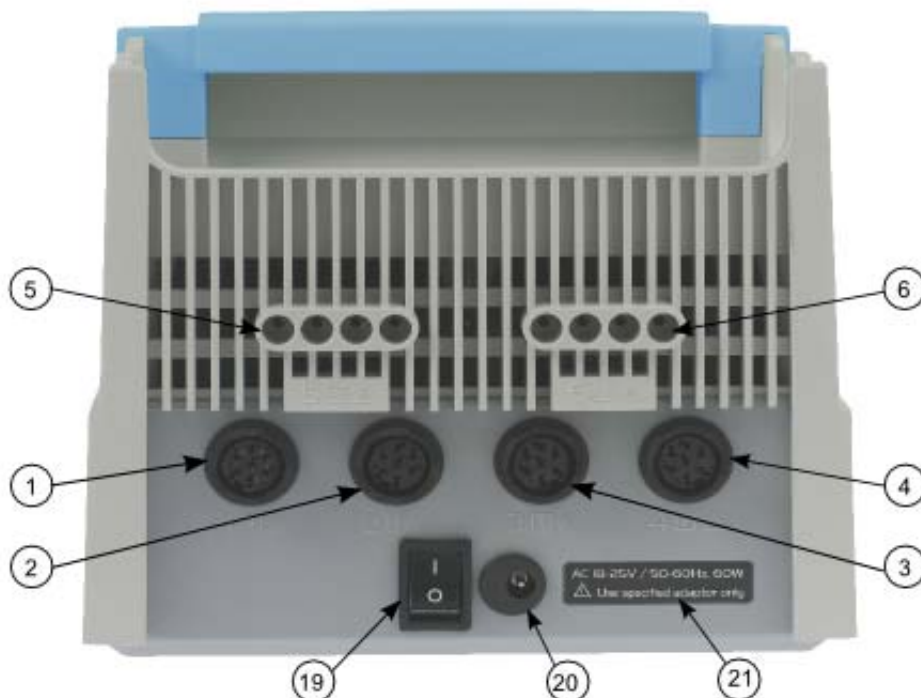
2 INSTRUCTIONS FOR USE

2.1 TOP PANEL



- 1. - 6 outputs for patient cables on the rear panel of the device, see chapter **Rear Panel**
- 7. display
- 8. **diag** key, for quick selection of diagnosis or programs
- 9. **prog** key, for quick selection of therapy program
- 10. **man** key, for manual setting of all therapy parameters
- 11. **menu** key, to set date, time, language, display contrast, sounds, user options, etc.
- 12. **select/intensity** knob, to select individual parameters
- 13. **enter** key, to confirm selection or setting
- 14. **esc** key, to cancel selection or setting and return to the original setting
- 15. **tab** key, for switching between the buttons on the display
- 16. **next** key, for fast entering the therapy parameters subscreens
- 17. key **1** for switching to the tab of the first generator
- 18. key **2** for switching to the tab of the second generator

2.2 REAR PANEL



- 1 -6 patient outputs – for exact configuration, see table **Configuration of Output Connectors**
- 19 mains switch, for switching the device on/off – positions I / 0.
- 20 socket for connection of external power supply Adapter 60W / Adapter 90W
- 21 warning label with parameters of power supply and input of the device

2.3 FRONT PANEL



- 22 display of the remaining time of therapy for the first channel
- 23 display of the remaining time of the therapy for the second channel (or current intensity in case the channel is only one)
- 24 **start / stop1** key, for starting or pausing the therapy on the first channel
- 25 **start / stop2** key, for starting or pausing the therapy on the second channel
- 26 **on / off** switch – serves for switching the device on/off
- 27 **service connector** placed under the cover **and** then the type, manufacture and warning **labels** (they are placed on the bottom cover of the device)

2.4 UNPACKING AND ASSEMBLY

Inspect the box for damage and report any damage to the carrier and your distributor. Do not proceed with installation and assembly if the box is damaged.

Unpack the equipment and place it on a stable horizontal surface suitable for the equipment's weight, out of reach of sunlight. During the operation the equipment gets warm, therefore it must not be located close to heat-producing devices. Cooling of the equipment is provided by forced air circulation. Cooling vents are located on the rear panel and at the bottom of the equipment and must not be covered. Place the equipment so, that the free space behind the rear side is at least 10 cm. Do not position the equipment on a soft surface which may obstruct air flow to the bottom cooling vents. Do not put any heat-producing devices or objects containing water or other liquid on the equipment. Do not place the equipment close to devices producing strong electromagnetic, electric or magnetic field (diathermy, X-rays, etc.), as equipment electronics could be undesirably influenced. In case of any questions, please call your distributor or service agent.

The same installation conditions should be observed for the Adapter 60W / Adapter 90W power supply adapter.

Retain the original packaging to ensure future possible transportation of the device.

Plug the device into the mains socket by means of the Adapter 60W / Adapter 90W power supply adapter (see chapter **Technical Parameters**).

PLUG THE POWER SUPPLY ADAPTER DIRECTLY INTO THE MAINS SOCKET; DO NOT USE ANY MULTI-CONNECTION EXTENSION CABLE OR ADAPTOR.

In case of any questions, please call your distributor or service agent.

Switching the device on:

Connect the power supply adapter to the device and plug its mains cable into the mains socket, switch the **I / 0 rocker switch (19)** on the rear panel to the **I** position and finally press the **ON/OFF switch (26)** on the front panel. The system will then run a self-test. If the self-test finds no faults, the screen will display the equipment type and it is ready for use - see note below.

Connection of accessories

Connect the accessories to the output connectors **(1) - (6)** on the rear panel in this way:

Put in the cable connector and secure the fluted ring by pressing and turning in clockwise. **ATTENTION WHEN DISCONNECTING THE CONNECTOR**, first of all, it is necessary to take by the fingers the fluted ring **NOT THE WHOLE** connector. **TURN THE FLUTED RING ANTICLOCKWISE** and then after releasing the ring, disconnect the connector by pulling the fluted ring still held in the fingers!

ATTENTION!!! DO NOT TURN THE WHOLE CONNECTOR USING FORCE, THE DEVICE COULD BE DAMAGED.

For configuration of the output connectors (1) to (6), see the table **Configuration of Output Connectors**

The unit will automatically detect the accessories type and display it on the screen. If a wrong one is connected, the equipment will not operate and the screen will display a warning and help about where to connect which accessory.

Recharging the accumulator

The device accumulator is sold in half-charged status. That is why we recommend formatting the accumulator after purchase of the device: connect the device to the mains via the external adapter for at least 48 hours without interruption, with the **mains rocker switch (18) in position I**. The device will be recharged and the accumulator will be properly formatted. A properly formatted accumulator enables longer operation of the device without mains supply. For details, see the chapter **Accumulator**.

Restart of the device - reset

If for any reason (electromagnetic interference, etc.) the device stops responding to the user's commands and the message "please wait..." with small moving squares is not displayed, the device can be put into the initial state by simultaneously pressing the **prog (9)** and **menu (11)** keys. After this, the device immediately goes into the initial status as well as after switch-on of power supply.

The **mains switch (19)** on the rear panel has the same effect – the whole device switches off; however, we recommend using the above described combination of keys **prog + menu** which is more friendly to the electronics of the device.

Note:

After switching on, the unit tests for about 10 - 15 secs all internal functions. If any fault exists, the screen will display a warning. If any fault that compromises patient safety exists, the system will 'lock' itself into 'secure' mode. If this situation occurs, please call your local distributor for service advice.



Tab. 2.1 Configuration of output connectors

Device Type	output 1	output 2	output 3	output 4	output 5	output 6
BTL-4610 Puls Optimal						E1opti
BTL-4615 Puls Optimal						E1opti
BTL-4620 Puls Optimal					E2opti	E1opti
BTL-4625 Puls Optimal					E2opti	E1opti
BTL-4110 Laser Optimal	L1A	L1B	door	acup.		
BTL-4710 Sono Optimal	U1A	U1B	E input	E output		
BTL-4210 Sono Optimal	T1A	T1B	E input	E output		
BTL-4810 S Combi Optimal	U1A	U1B				E1opti
BTL-4815 S Combi Optimal	U1A	U1B				E1opti
BTL-4810 L Combi Optimal	L1A	L1B	door			E1opti
BTL-4815 L Combi Optimal	L1A	L1B	door			E1opti
BTL-4800 SL Combi Optimal	U1A	U1B	door	L1A		
BTL-4800 TL Combi Optimal	T1A	T1B	door	L1A		
BTL-4810 M Combi Optimal			M1A	M1B		E1opti
BTL-4815 M Combi Optimal			M1A	M1B		E1opti
BTL-4810 T Combi Optimal	T1A	T1B				E1opti
BTL-4815T Combi Optimal	T1A	T1B				E1opti
BTL-4816 S Combi Professional	E1A	E1B	U1B	U1A		
BTL-4818 S Combi Professional	E1A	E1B	U1B	U1A		
BTL-4816 L Combi Professional	E1A	E1B	door	L1A		
BTL-4818 L Combi Professional	E1A	E1B	door	L1A		
BTL-4816 M Combi Professional	E1A	E1B	M1	M2		
BTL-4818 M Combi Professional	E1A	E1B	M1	M2		
BTL-4800 LM Combi Optimal	L1A	Door	M1A	M1B		
BTL-4800 SM Combi Optimal	U1A	U1B	M1A	M1B		
BTL-4920 Magnet Optimal			M1A	M1B		
BTL-4610 Puls Professional*				E1		
BTL-4615 Puls Professional*				E1		
BTL-4620 Puls Professional			E2	E1		
BTL-4625 Puls Professional			E2	E1		
BTL-4110 Laser Professional	L1A	L1B	door	acup.		
BTL-4710 Sono Professional	U1A	U1B	E input	E output		
BTL-4210 Sono Professional	T1A	T1B	E input	E output		
BTL-4810 S Combi Professional	U1A	U1B		E1		
BTL-4815 S Combi Professional	U1A	U1B		E1		
BTL-4810 L Combi Professional	L1A	L1B	door	E1		
BTL-4815 L Combi Professional	L1A	L1B	door	E1		
BTL-4800 SL Combi Professional	U1A	U1B	door	L1A		
BTL-4800 TL Combi Professional	T1A	T1B	door	L1A		
BTL-4810 M Combi Professional		E1	M1A	M1B		
BTL-4815 M Combi Professional		E1	M1A	M1B		
BTL-4810T Combi Professional	T1A	T1B		E1		
BTL-4815T Combi Professional	T1A	T1B		E1		
BTL-4800 LM Combi Professional	L1A	door	M1A	M1B		
BTL-4800 SM Combi Professional	U1A	U1B	M1A	M1B		
BTL-4920 Combi Professional			M1A	M1B		

* can be extended by the HVT module



Notes:

E1	connector for connection of electrotherapy accessories (BTL-236-1(2), BTL vac) to the E1 generator
E2	connector for connection of electrotherapy accessories (BTL-236-1(2), BTL vac) to the E2 generator
E1opti	connector for connection of electrotherapy cables (BTL-226, BTL vac) to the E1 generator
E2opti	connector for connection of electrotherapy cables (BTL-226, BTL vac) to the E2 generator
E1A, E1B	connector for connection of electrotherapy accessories (BTL-236-1(2), BTL vac) to the double generator E1
L1A, L1B	connector for connection of laser probe/ cluster BTL-448 / BTL-445 to the L1 generator
L2A, L2B	connector for connection of laser probe/ cluster BTL-448 / BTL-445 to the L2 generator
U1A, U1B	connector for connection of ultrasound head BTL-237, e.g. 1 / 4 cm ² , to the U1 generator
M1A, M1B	connector for connection of magnetotherapy applicators (BTL-239) to the M1 generator
E input	connector for input of external electrotherapy BTL-46xx , BTL-56xx on the ultrasound device at combined therapy
E output	connector for output of external electrotherapy BTL-46xx , BTL-56xx on the ultrasound device at combined therapy
door	connector for the open door sensor
acup.	connector for the acupuncture electrode

How many patients and which outputs you can simultaneously connect to can be seen on the display after pressing the **menu** key, in **menu / accessories / connectors – information**.

2.5 OPERATING THE UNIT

The display contains several graphic elements. Some of them are only for information, some can be activated.

The basic elements are the following:

- buttons (it is possible to activate them by the **tab** key (**15**) and to change their values.) The activated buttons are displayed inversely.
- information texts
- channel tabs (switching between the tabs, selection)

The buttons can be enabled or disabled. The disabled buttons are crossed out.

All the displayed enabled buttons can be successively activated by pressing the **tab** key (**15**). By repeated pressing of this key further buttons on the screen are successively activated.

If the button contains one numeric value, this value can be directly changed by the **select/intensity** knob (**12**). If the button contains more numeric values or an item selected from a list, pressing of the **enter** key (**13**) opens the detailed subscreen of the button. In the bottom right corner of the selected parameters screens there is a button shaped like a folded corner of paper. It has the same function as the **NEXT** key (**16**) and opens the parameters subscreens. To leave the subscreen press **esc** (**14**) – all data you have changed will remain changed.

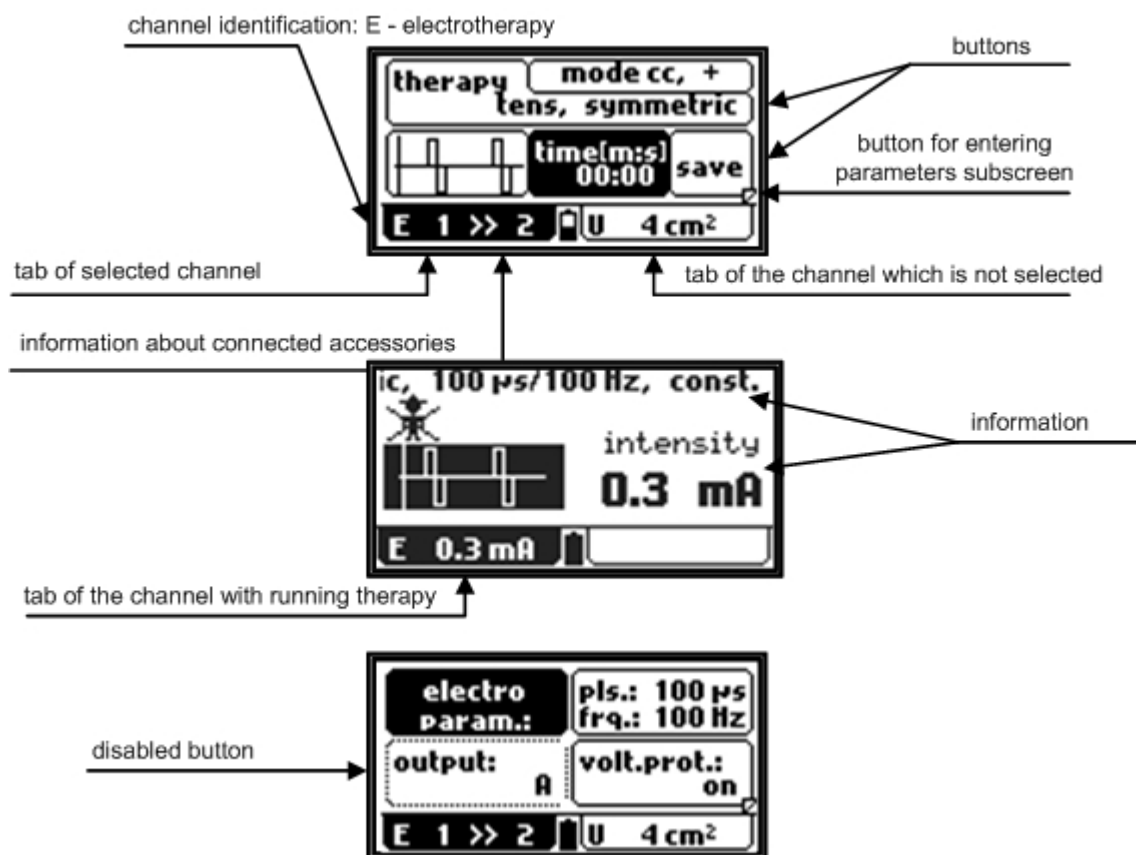
Information texts

The text is displayed directly on the display, in a menu or in a button. If a text is too long and does not fit on the display in full, after a while it starts scrolling automatically.

Selected channel

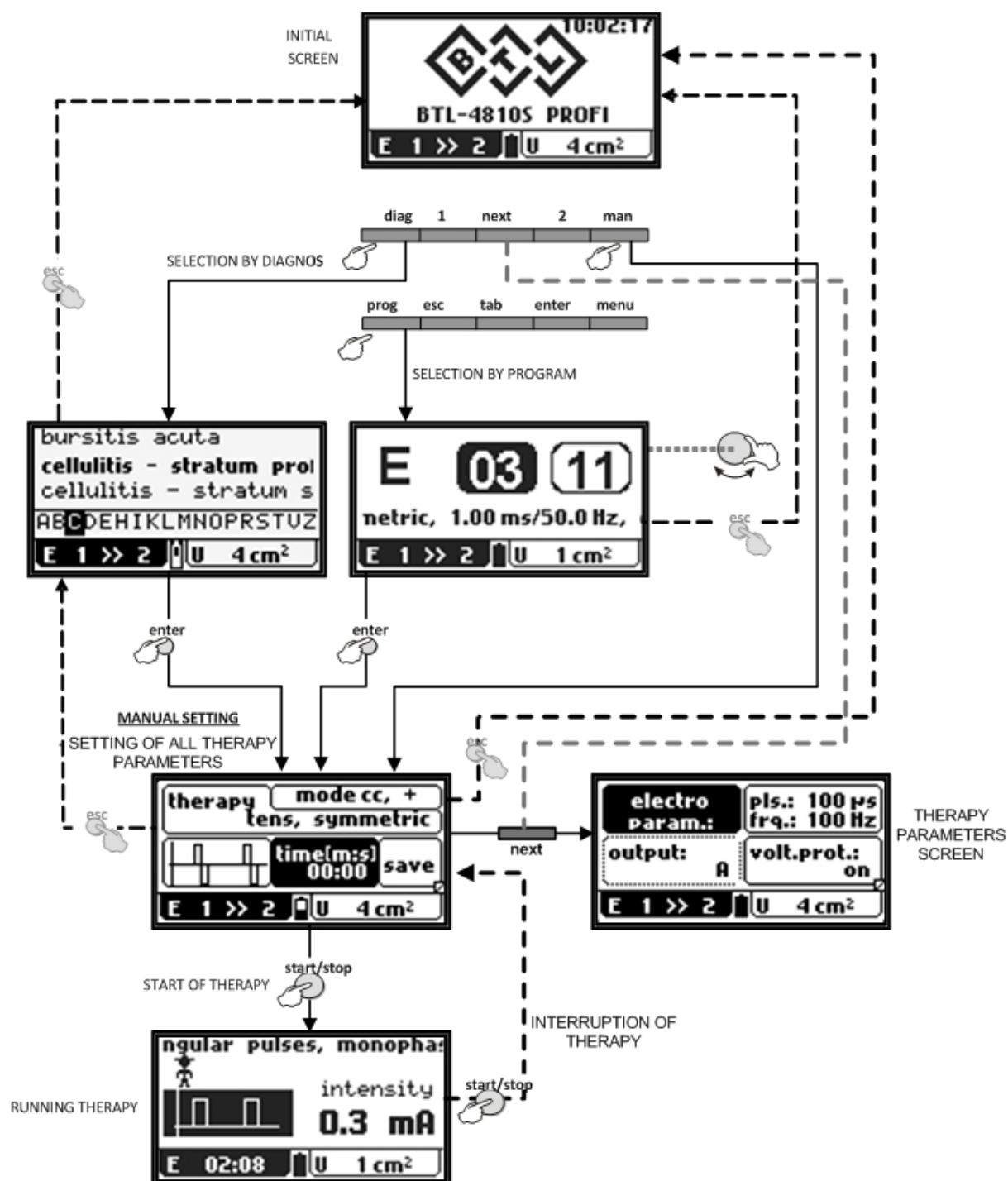
Although most of the devices of the BTL-4000 Series can run more therapies at a time, only one channel can be controlled at the particular moment. That channel is called the "selected channel". The tab of the "selected channel" in the bottom part of the screen is coloured dark. All information on the screen and all controls are relate to this channel. The most important information about the therapies on the other channels remains visible on their tabs.





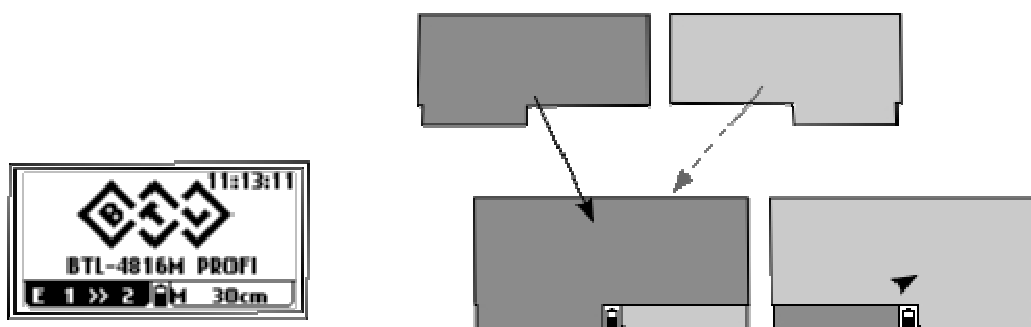
2.6 THERAPY SETTING

2.6.1 THERAPY FLOW CHART



2.6.2 WELCOME SCREEN AND SELECTION OF CHANNELS, TABS AND ACCESSORIES

Besides the initial information, this screen contains channel tabs with description of the connected accessories. The number of channels – tabs depends on the required configuration of the device. To display all information of the channel press key **1 (17)** or **2 (18)** under the tab. The information set on the "invisible channels" remain preserved. The following scheme shows that almost the entire screen is available for the "selected channel".



Keys **1(17)** and **2(18)** located directly under the tabs serve for switching between the tabs.

On the channels where more accessories can be connected to one generator (ultrasound generator and two ultrasound heads, laser generator and laser probes, magnet generator and magnet applicators), repeated pressing of the tab's key serves for switching between these accessories.

The tab of the channel which is selected (i.e. its information is just on the display) is black.

Examples of information on the tabs:

E ?

tab of the selected E channel, to which no accessory is connected

E 1 >> 4

tab of the E channel, which is not selected, with connected accessory BTL-236-2

U 1 cm²

U 4 cm²

tab of the U generator, which is not selected, with connected ultrasound head; pressing of keys **1 (17)** and **2 (18)** under the tab serves for switching between the connected heads – 1 cm²/4 cm²

L 685 nm

L 830 nm

tab of the selected L generator with connected laser probe; pressing of keys **1 (17)** and **2 (18)** under the tab serves for switching between the connected probes– 685nm/830nm (red/infrared)

M 13x13

tab of selected M generator with connected disc applicator;

U 830 nm

tab of the selected E2 channel with unsuitable connected accessory, which this generator cannot work with

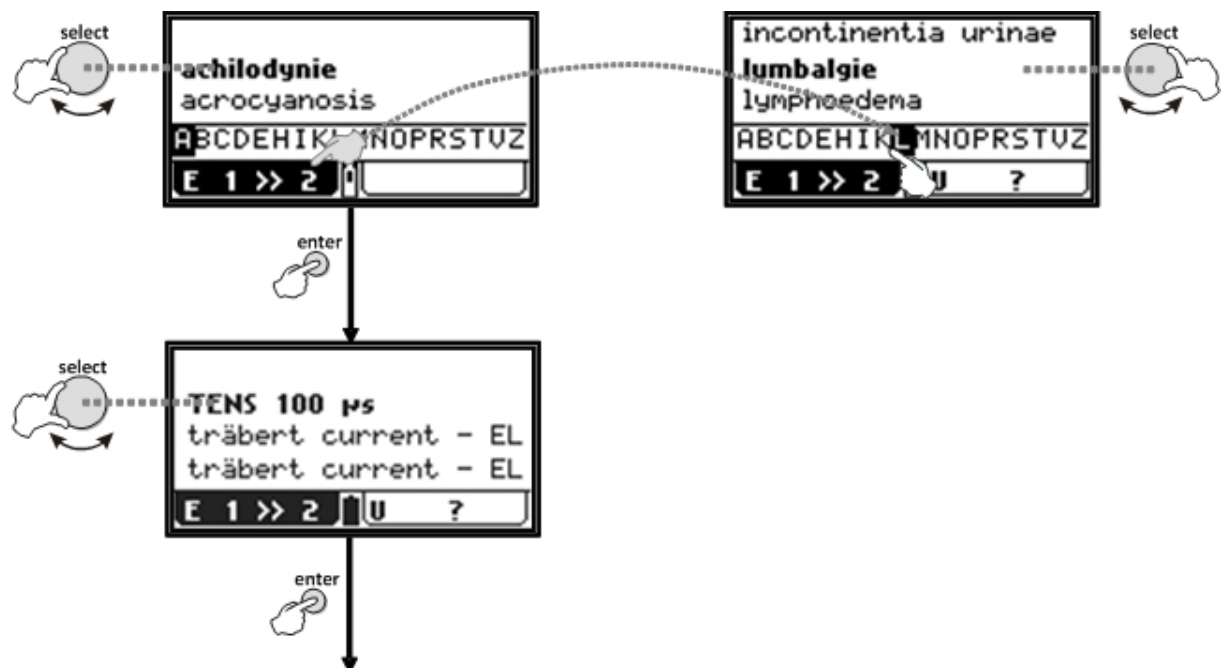
2.6.3 SETTING OF THERAPY PARAMETERS VIA THE SELECTION OF DIAGNOSIS – "DIAG" KEY

To view the list of diagnoses press the **diag** key (8). Each channel tab has its own list of therapy protocols. The letter in front of each number corresponds to the type of selected therapy: **E** – electrotherapy; **U** – ultrasound; **L** – laser; **M** – magnetotherapy. For example, the channel tab of the ultrasound generator includes a list of therapy protocols for ultrasound treatment. If the tab depicts an HVT or combined therapy symbols, the list includes protocols for HVT or combined therapies.

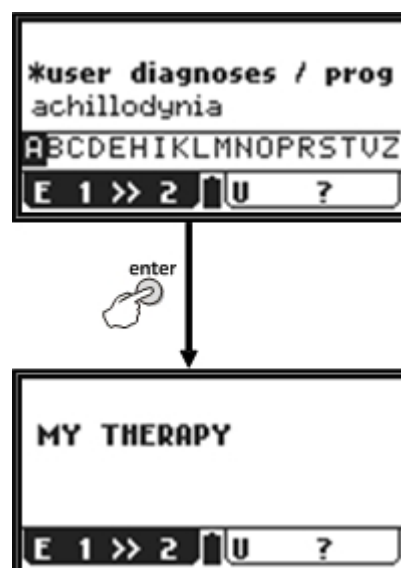
For moving in the list of diagnoses use the **select/intensity** knob (12). The currently selected diagnosis is displayed in bold.

For fast finding of a diagnosis, select its initial letter by the **tab** key (15).

After finding of the required diagnosis, select it by pressing the **enter** key (13). If to the diagnosis are assigned more therapies – e.g. the treatment can be done by several various types of current – the list of therapies appears after selection of the diagnosis. Select the required therapy by the **select** knob (12) and press **enter** (13) again.



Saved by user protocols can easily be find in the “*user diagnoses / programs” item, which appears at the top of the diagnoses list.



2.6.4 SETTING OF THERAPY PARAMETERS VIA THE SELECTION OF PROGRAM – "PROG" KEY

Press the **prog** (8) key to set the required program number. The program numbers generally correspond to the program numbers used in the traditional BTL physiotherapy line. The letter in front of each number corresponds to the type of therapy selected: **E** – electrotherapy; **U** – ultrasound; **L** – laser; **M** – magnetotherapy.

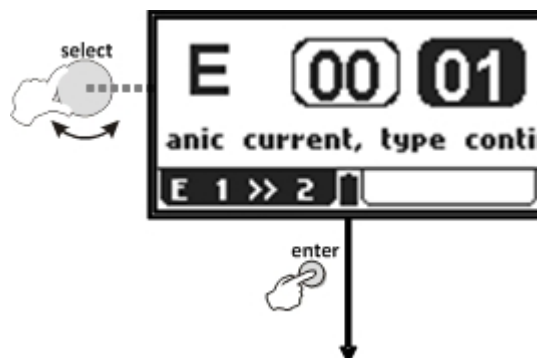
Combined therapies E+U are listed among **E** programs and can be found on the electrotherapy tab with the ultrasound head symbol. They are in the positions **E-35xx** - **E-39xx**.

Your own therapy protocols (except sequences) can be saved under the following numbers: **E-80xx** - **E-89xx** for electrotherapy, **U-80xx** - **U-89xx** for ultrasound therapies, **L-80xx** - **L-89xx** for laser therapies and **M-80xx** - **M-89xx** for magnetotherapy.

Your own sequences are saved under the following numbers: **E-95xx** - **E-99xx** for electrotherapy, **U-95xx** - **U-99xx** for ultrasound therapies, **L-95xx** - **L-99xx** for laser therapies and **M-95xx** - **M-99xx** for magnetotherapy.

Programs recommended for diagnoses can be found in the User's Guide.

For faster setting, the program numbers are arranged into pairs. For change of the number use the **select** knob (12), for switching between the pairs of digits use the **tab** key (15).

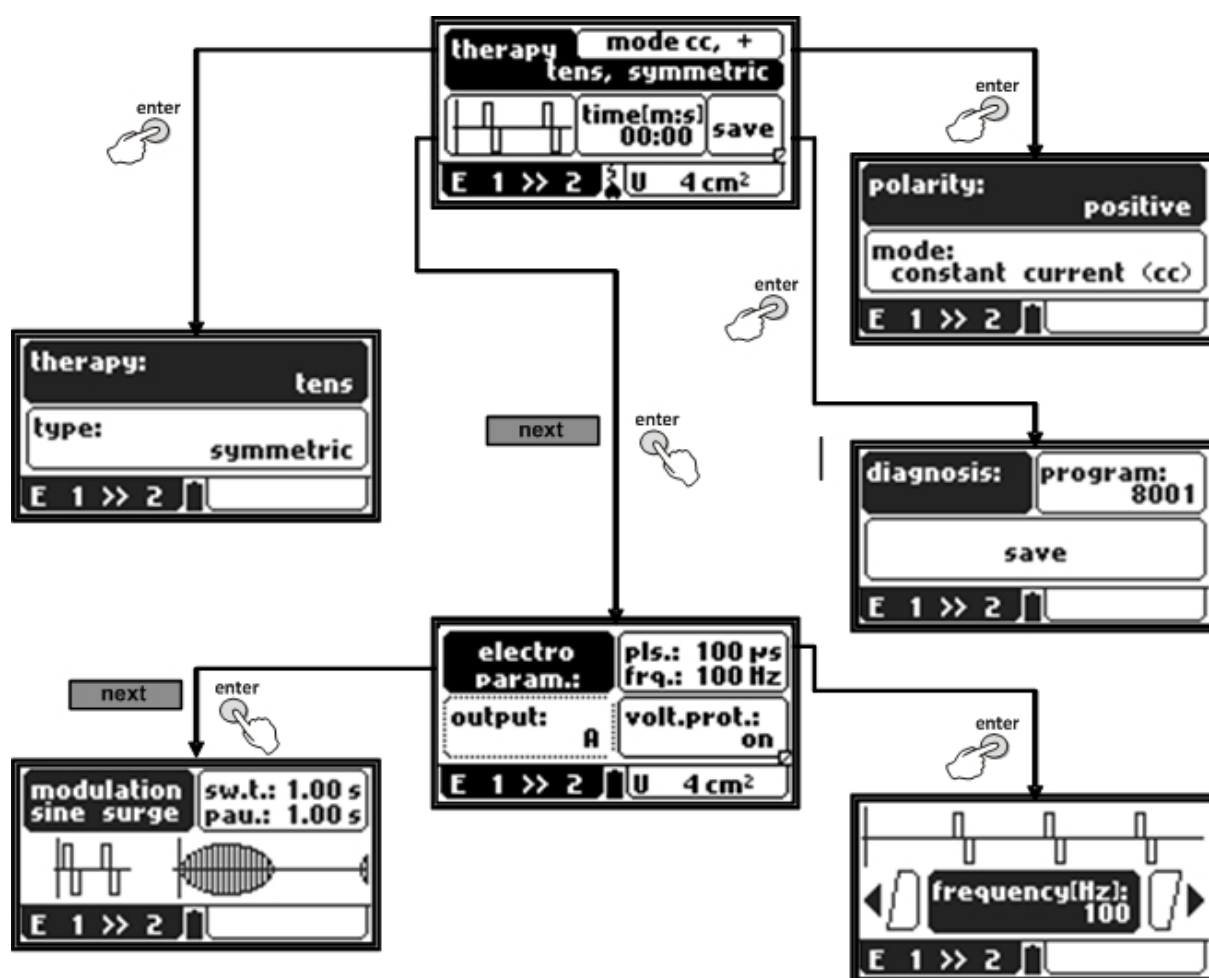


2.6.5 SETTING OF THERAPY PARAMETERS MANUALLY VIA THE 'MAN' KEY

Press the **man (9)** key to select manual setting for the therapy. All therapy parameters can be set and saved as a user program or diagnosis.

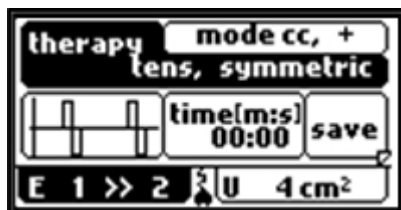
It is obvious that the therapy parameters screens of individual currents of electrotherapy, ultrasound therapy and laser therapy differ in dependence on the options which can be set in the particular moment. For more details see the respective **User's Guide**.

To open the required menu or setting dialog select the respective button by the **tab key (15)** and then press **enter (13)**. For fast entering the therapy parameters subscreens use the **"next"** key. Most dialogs are accompanied with illustration pictures and symbols. See the scheme of possibilities of individual settings in this mode.



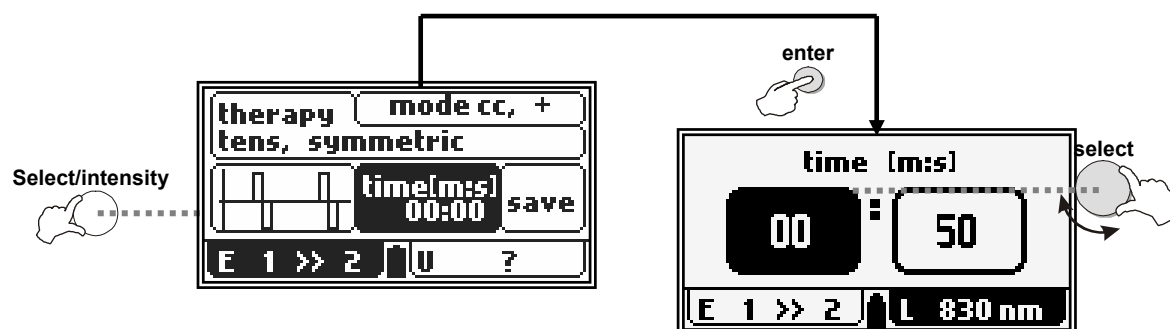
2.6.6 THERAPY PARAMETERS SCREEN

This screen opens after selection of therapy after pressing the **diag** (8), **prog** (9) or **man** (10) key, (see the chapter **Therapy Setting Flow Chart**). Before the start of therapy you can change all parameters.



- **SETTING THERAPY TIME**

The time of the therapy can be set only on the therapy parameters screen, either by activation of the **time** button and pressing of the **enter** key (13) after which the time setting dialog opens, or by fast selection using the **select / intensity** knob (12).



By pressing the **start / stop1** (24) or **start / stop2** (25) keys you can start or interrupt therapy – see chapter **Start, Interruption and End of Therapy**

- **INTENSITY SETTING**

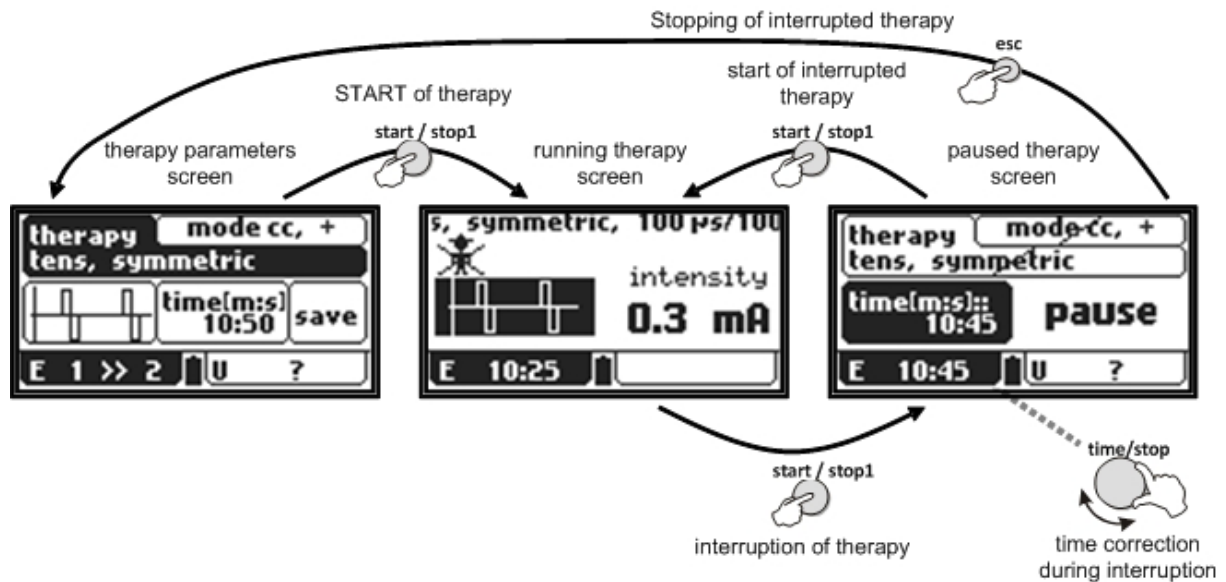
For the ultrasound, laser and magnet therapies, the intensity (power) can be set only on the therapy parameters screen and only when the therapy is not running. To set the intensity, select the **intensity** option and adjust the required value by turning the **select/intensity** knob. For the laser therapy, the **power** option is situated in the therapy parameters subscreen, which can be accessed by pressing the **next** key.

To the electrotherapy, the intensity is set during therapy running, and can only be adjusted by turning the **select/intensity** knob (12).

2.7 COURSE OF THERAPY

2.7.1 START, INTERRUPT AND END OF THERAPY

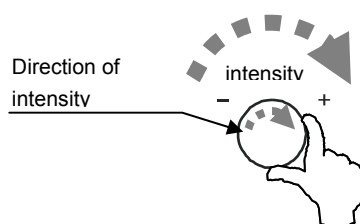
To start therapy on the first channel (tab) press the **start / stop1** key (24). To start therapy on the second channel press the **start / stop2** key (25). Therapy can be started only if the display of the selected channel is displaying the therapy parameters screen.



The paused therapy can be resumed by pressing the **start / stop1** (or **start / stop2**) key or stopped by pressing the **esc** (14) key.

While the therapy is paused, you can adjust the time (except for laser therapies and all types of sequences) by the **select / intensity** (12) knob.

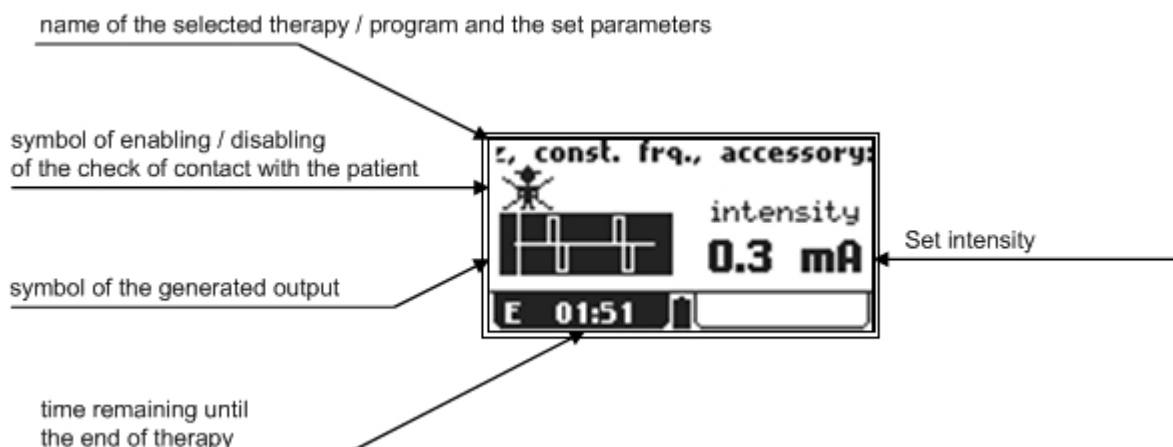
For **electrotherapy**, you can adjust the intensity during therapy running by turning the **select / intensity** (12) knob to the right (to increase intensity) or to the left (to decrease intensity).



Laser therapy can also be started / paused by the **start / stop** key on the laser probe.



2.7.2 RUNNING THERAPY SCREEN



2.7.3 ELECTROTHERAPY – SETTING DURING THERAPY

• SETTING THE INTENSITY IN 4-ELECTRODE THERAPIES

Making a therapy with four electrodes, you can set different intensities between each pair of electrodes. In case of 4-pole interference, the output intensity is set by the **select / intensity** (12) knob on both channels at the same time (the screen button **1+2** is pressed) or on each channel separately (the screen button **1** or **2** is pressed). For switching among the buttons use the **tab** key (15).



If the intensity on one of the channels is set to zero, the therapy is terminated.

• 4-POLE ELECTROTHERAPY GENERATOR

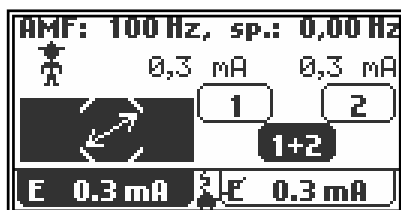
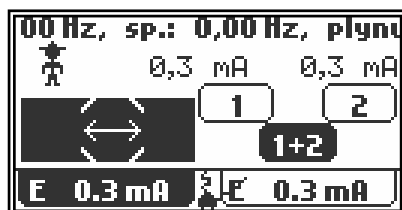
Devices equipped with 4-pole electrotherapy generator enable starting of 4-pole interference and special interference just with using of single channel. This way the second channel stays active for starting another therapy. Between individual pairs of electrodes is possible to set different intensity values. Setting of output intensity is the same as in precedent.

Note:

Devices equipped with 4-pole electrotherapy generator cannot be connected with HVT module and they do not allow starting the therapy with microcurrents.

• MANUAL CONTROL OF VECTOR IN DIPOLE INTERFACE

In manually-controlled dipole interference, the dipole angle in the intersection of the electrodes is set during therapy by the **enter** knob (13) for turning to the right, and by the **esc** knob (14) for turning to the left. The position of the dipole is symbolized on the screen above the time value.



When rotating the dipole, the unit automatically switches to diagnostic mode (Spectrum value = 0Hz). After 1 or 2 seconds the unit returns to therapeutic mode (Spectrum value = preset value).

2.7.4 ACCESSORIES / APPLICATORS – VISUAL SIGNALIZATION.

Accessories BTL-236 (for electrotherapy) and BTL-237 (ultrasound heads) and BTL-239 (magnetic applicators) feature blue pilot lights that signal their operating conditions:



BTL-236-1: patient cable with two electrodes – blue and yellow pilot light signals:

- **slow blinking** – accessories ready for therapy – therapy settings screen displayed
- **continuous light** – therapy in process, possible dangerous voltage on electrodes



BTL-236-2: patient cable with four electrodes – blue and yellow pilot light signals:

- **slow blinking** – accessories ready for therapy – therapy settings screen displayed; always the pilot light at the selected pair of electrodes A or B is blinking
- **blinking in rhythm of generated currents or continuous light** – therapy in process, dangerous voltage may be on the pair of electrodes A or B at which the pilot light is blinking



BTL-237: ultrasound head 1 cm² or 4 cm² – blue pilot on the head:



- **slow blinking** – accessories ready for therapy – therapy settings screen displayed

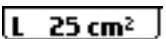


- **continuous light** – the therapy in process
- **rapid blinking** – wrong contact of head with patient's tissue, therapy paused; contact must be re-established to continue therapy



BTL-448: laser probes 635 nm and 830 nm – green pilot light and focusing beam:

- **blinking in rhythm of generated laser or continuous light** – the device is generating laser radiation, during generation the device indicates occurrence of laser radiation by acoustic signal



BTL-445: laser clusters: red, infrared and combined – focusing beam:

- **blinking in rhythm of generated laser or continuous light.** Laser irradiation is also indicated by acoustic signal



BTL vac: vacuum unit for electrotherapy – see separate manual for **BTL vac** unit.

For detailed information please refer to the leaflet which is enclosed to each accessory supplied.



BTL-239-1: disc magnetic applicator – blue pilot light signals:

- **slow blinking** – accessories prepared for therapy, therapy settings screen displayed.
- **continuous light or blink in therapy rhythm** – therapy in process.



BTL-239-2: solenoid ø30 cm magnetic applicator – blue pilot light signals:

- **slow blinking** – accessories prepared for therapy, therapy settings screen displayed.
- **continuous light or blink in therapy rhythm** – therapy in process.



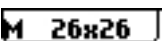
BTL-239-3: solenoid ø60 cm magnetic applicator – blue pilot light signals:

- **slow blinking** – accessories prepared for therapy, therapy settings screen displayed.
- **continuous light or blink in therapy rhythm** – therapy in process.



BTL-239-4: double disc magnetic applicator – blue pilot light signals:

- **slow blinking** – accessories prepared for therapy, therapy settings screen displayed.
- **continuous light or blink in therapy rhythm** – therapy in process.



BTL-239-5: multi disc magnetic applicator – blue pilot light signals:

- **slow blinking** – accessories prepared for therapy, therapy settings screen displayed.
- **continuous light or blink in therapy rhythm** – therapy in process.



BTL-239-6: linear magnetic applicator – blue pilot light signals:

- **slow blinking** – accessories prepared for therapy, therapy settings screen displayed.
- **continuous light or blink in therapy rhythm** – therapy in process.



BTL-239-8: solenoid ø70 cm magnetic applicator with couch – blue pilot light signals:

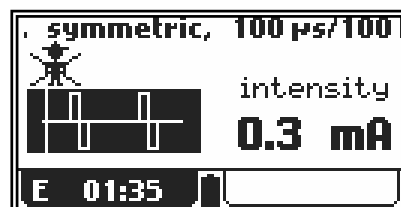
- **slow blinking** - accessories prepared for therapy, therapy settings screen displayed.
- **continuous light or blink in therapy rhythm** – therapy in process

2.7.5 INDICATION OF OPERATION – ENERGY ON OPERATION

Electrotherapy

Presence of electrotherapy voltage on output is indicated:

- on the screen:
 - by value of intensity of output current
 - by an animated icon of running electrotherapy current
- on the channel tab – by value of intensity or running time
- on the electrotherapy accessory BTL-236 – by continuously lit blue pilot light.



Disconnection of electric circuit (such as in the case of wrong contact between electrode and patient) is indicated by blinking information about intensity and time on the corresponding electro generator tab, or by audio signalling.

This function can be switched on and off in the menu of the unit (press **menu** key (11), select **menu – specific settings – check contact of electrodes**). Its current state is marked by a figure symbol (crossed-out if disabled). Audio signalling can be switched on and off - marked by a bell symbol on the screen (crossed-out if disabled).

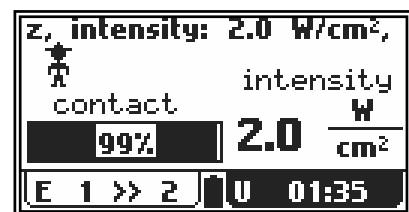
Note:

Some types of the generated currents do not allow monitoring of the contact with the patient. In such cases the crossed-out figure is displayed, regardless of the user setting of detection.

Ultrasound Therapy

Generation of ultrasound energy by ultrasound head BTL-237 is indicated:

- on the screen:
 - by value of intensity
 - by bar-graph showing contact of head with tissue
- on the channel tab – by value of intensity and time
- on the ultrasound accessory BTL-237 – by blue light ring.

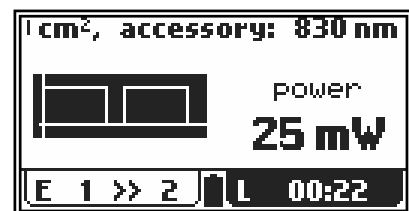


Insufficient contact between the ultrasound head and the tissue is indicated by rapid blinking of the blue light ring on the head and blinking of the information on intensity and time on the channel tab of the corresponding ultrasound generator. This function is indicated by a figure symbol on the screen. This function is indicated by a figure symbol on the screen.

Laser Therapy

Laser irradiation by BTL-448 laser probe is indicated:

- on the screen:
 - by power value
 - by signal icon
- on the channel tab – by value of intensity and time
- by acoustic signal. Signalling can be enabled or disabled from the menu (press **menu** key (11), select **menu – specific settings – sound in running therapy**)
- by green pilot light on laser probe
- by green or red focused beam.



Laser irradiation by BTL-445 laser cluster is indicated:

- on the screen:
 - by intensity value
 - by icon of the signal
- on the channel tab – by value of intensity and time
- by acoustic signal. Signalling can be enabled or disabled from the menu (press **menu** key (10), select **menu – specific settings – sound in running therapy**)
- by blue focusing beam.

Magnetotherapy

Presence of magnetotherapy field on output is indicated:

- on the screen:
 - by value of intensity of output magnetic field
 - by icon of running magnetic field
- on the channel tab – by value of intensity and remaining time
- on the magnetic applicator BTL-239 – by blue pilot light.



2.8 THERAPY PARAMETERS

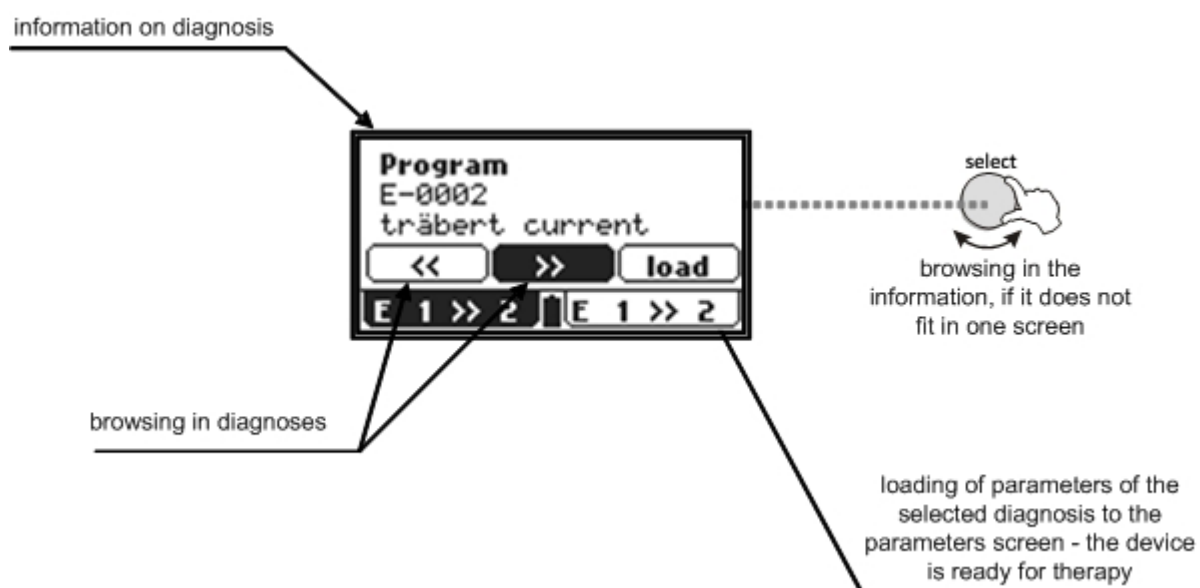
Therapy parameters are variable. Only the parameters that characterize the therapy and that can be set in manual mode are displayed - by pressing the **man (10)** key. For a detailed description of parameters for individual therapies, refer to the **User's Guide**.

2.9 ENCYCLOPAEDIA

The encyclopaedia provides information about individual therapies, examples of electrode and magnet applicator placement and application areas for ultrasound and laser. Each unit is supplied with a hard copy of the encyclopaedia. Its electronic format is included in the unit, and is available from **menu / encyclopaedia**.

Note: Treatment protocols and related information are only a guide and are not intended as a replacement for good clinical judgment and experience!

After opening of the encyclopaedia you get to its contents – the list of diagnoses. For browsing in the list use the **select/intensity** knob (12). After selection of the required diagnosis press the **enter** key (13) to get the specific information about the diagnosis:



2.10 THERAPY SAVING

Pressing the **save** button on the screen, the user can save the particular therapy setting under a name of diagnosis and number of program.

2.10.1 SAVE THERAPY

Therapy can be saved always after setting of the therapy parameters – i.e. from the **therapy parameters screen**.

The following information is saved with each therapy:

Electrotherapy:

- All parameters of currents (pulse length, pause length, modulation, etc.)
- Therapy time
- Polarity
- Output mode (current / voltage)*

Ultrasound therapy:

- All therapy parameters (for example, ultrasound frequency, duty factor - DF, pulse frequency, etc.)
- Therapy time
- Intensity

Combined therapies electro + ultrasound:

- All electrotherapy parameters (pulse length, pause length, modulation, etc.)
- All ultrasound therapy parameters (ultrasound frequency, duty factor - DF, pulse frequency, etc.)
- Therapy time
- Polarity of electrotherapy output
- Electrotherapy output mode (current / voltage)
- Intensity of ultrasound

Laser therapy:

- All therapy parameters (frequency, course of signal, etc.)
- Irradiated area
- Dosage

Magnetotherapy:

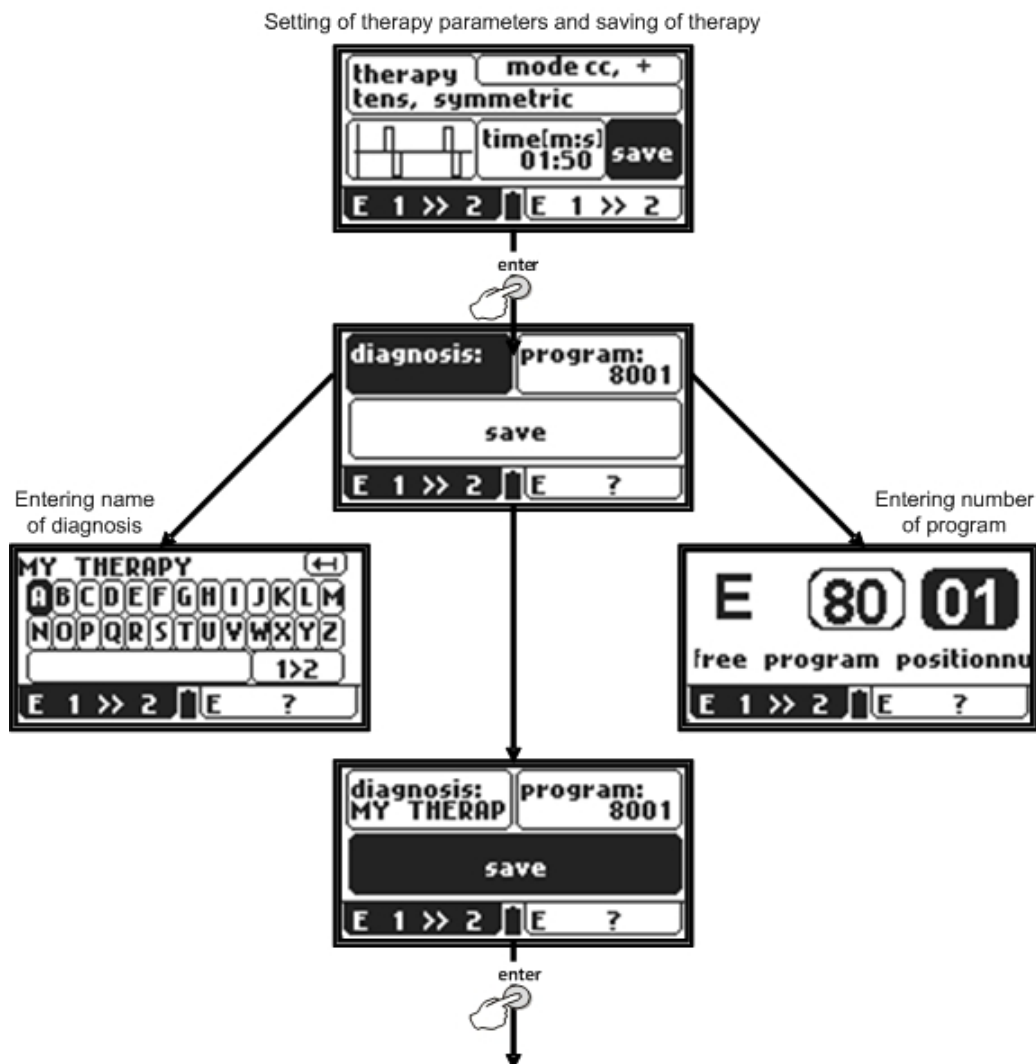
- All magnetotherapy parameters (pulse, pause, modulation, random frequency)
- Pulse shapes
- Therapy time
- Intensity of magnetic field

When saving a therapy, enter:

- name of diagnosis (therapy) – will be displayed in the list of diagnoses under the **diag** key (8)
- number of program – will be displayed in the list of diagnoses under the **prog** key (9)

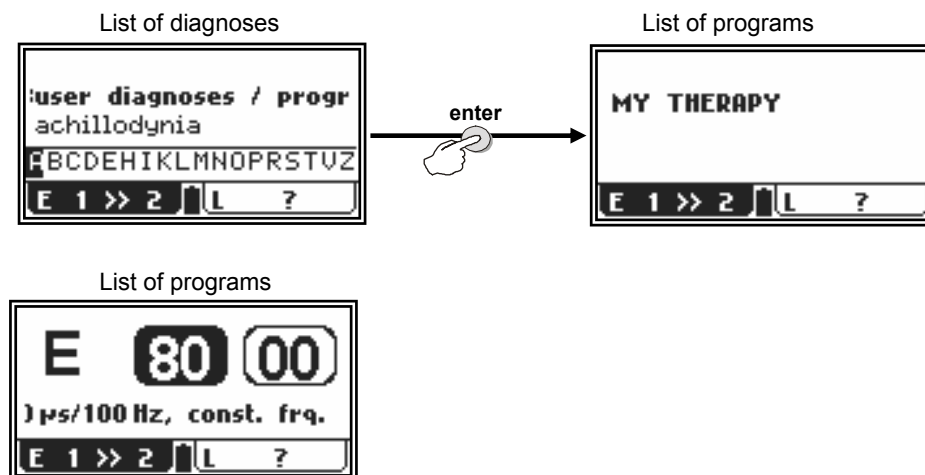


The number of the saved program falls within the interval from 8000 to 8999. and adds the letter of the corresponding generator (E for electrotherapy and combined therapies, U for ultrasound therapies, L for laser therapies and M for magnetotherapy).



The unit suggests the lowest available number (from the range of 8000-8999) and adds the letter of the corresponding generator (E for electrotherapy and combined therapies, U for ultrasound therapies, L for laser therapies and M for magnetotherapy).

Saved therapy goes in the list with the **user diagnoses / program**, which appear as an option at the top of the list with diagnose.

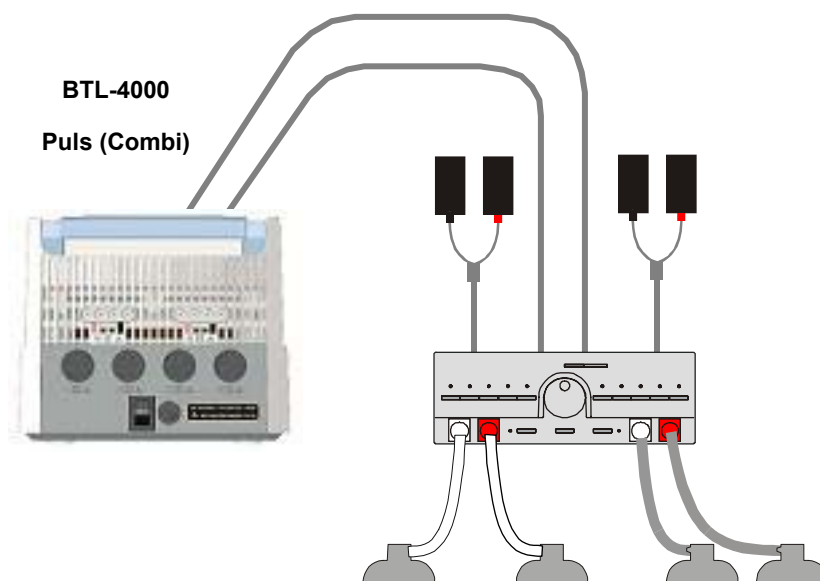


2.11 INTERCONNECTION OF UNITS

2.11.1 INTERCONNECTION OF BTL 4000 PULS (COMBI) AND VACUUM UNIT BTL VAC

Combine any **BTL-4000 Puls** or **Combi** unit with the vacuum unit **BTL vac** to apply electrotherapy currents by means of suction cup electrodes. Adjustable vacuum pressure ensures simple and convenient attachment of patient electrodes, especially on parts of the body hard to reach with classic electrodes. Moreover, the pulse mode provides mechanical massage of the tissue improves body metabolism and increases blood supply.

The electrotherapy unit has its outputs connected to the vacuum unit. Both vacuum and flat electrodes are attached to the vacuum unit. Each channel on the vacuum unit has a switch. When the switch is on, current is brought to the vacuum electrodes. When the switch is off, current is brought to the standard electrodes.



The picture is only an illustration. For the actual interconnection follow the table **Configuration of Output Connectors**.

For interconnection, use the interface cables leading from BTL-4000 Puls outputs E1, E2 (and connected to BTL vac inputs **IN1** and **IN2**). For more information, see the User's Guide of **BTL vac**.

2.11.2 INTERCONNECTION OF BTL-4000 PULS AND BTL-4000 SONO

If combined therapy is used, connect the ultrasound and electrical stimulation units together.

Electrotherapy BTL-46xx Puls or BTL-56xx Puls		Ultrasound BTL-4710 Sono or BTL-5710 Sono	
Connector	Connected accessories	Connector	Connected accessories
E1	interface cable to ultrasound	U1A	ultrasound head 1 cm ²
E2*	electrodes E2*	U1B	ultrasound head 4 cm ²
		E input	interface cable to electrotherapy
	* if installed	E output	electrodes E1

Setting of polarity between the ultrasound head and the electrode

After interconnection with the electrotherapy device, the ultrasound head becomes the anode (+). The other pole is the cathode (-), which is the electrode with the black banana plug. If the ultrasound head is required to be the cathode (-) during combined therapy, select 'negative polarity' in the therapy parameters screen of the electrotherapy unit.

ATTENTION

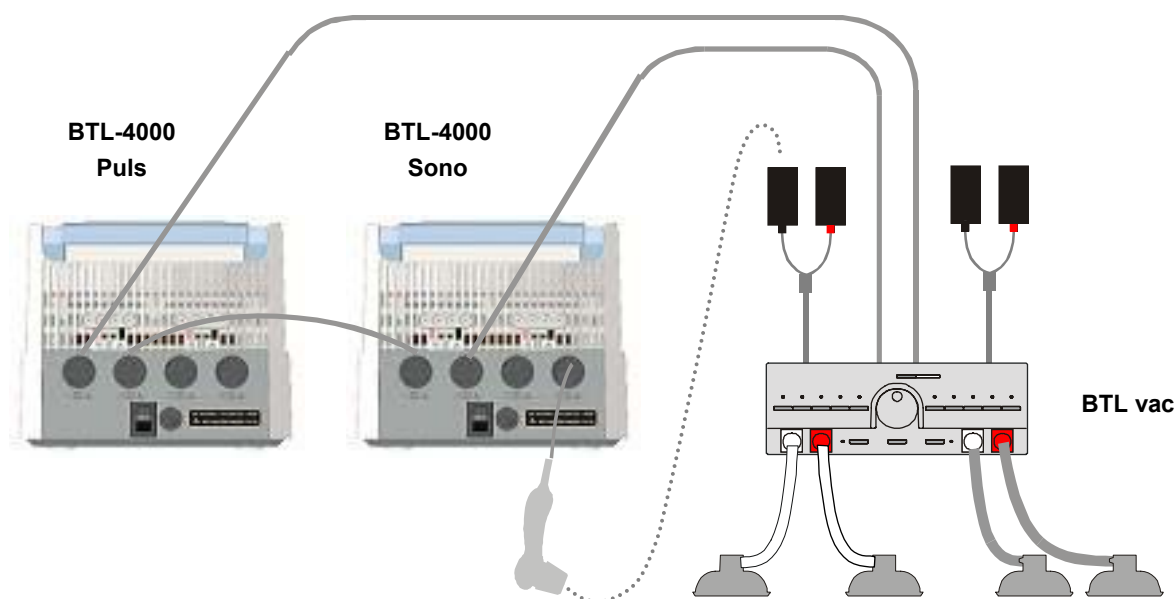
In the case of accessories „1>>2“ connected to the electrotherapy device, the ultrasound head becomes the anode (+). The cathode (-) is connected thru the **black banana plug** with minus sign “-“, on it.

In the case of accessories „1>>4“ (optional) connected to the electrotherapy device, the ultrasound head becomes the anode (+). The cathode (-) is connected thru **red banana plug** with plus sign “+“, on it, independent of selected output A or B.

If you want to apply only electrotherapy with such interconnected devices, it is no problem. Uncheck the option **"with electro"** on the BTL-4000 Sono device, and the electrotherapy electrodes are automatically connected to the electrotherapy output. Connectors E-input and E-output are interconnected inside the ultrasound device even if the BTL-4000 Sono device is off.

2.11.3 INTERCONNECTION OF BTL-4000 PULS, BTL-4000 SONO AND BTL VAC

To connect the units, follow this diagram:



The picture is only an illustration. For the actual interconnection follow the below-stated table as well as the **Table Configuration of Output Connectors**.

Electrotherapy BTL-46xx or BTL-56xx Puls		Ultrasound BTL-4710 Sono or BTL-5710 Sono	
Connector	Connected accessories	Connector	Connected accessories
E1	interface cable to ultrasound	U1A	ultrasound head 1 cm ²
E2*	interface cable to BTL vac (IN2)	U1B	ultrasound head 4 cm ²
		E input	interface cable to electrotherapy
	* if installed	E output	interface cable to BTL vac (IN1)

2.11.4 SETUP AND OPERATION OF COMBINED THERAPY IN INDIVIDUAL DEVICES

After checking for correct interconnection of the electrotherapy and ultrasound units, select a diagnosis or program that utilizes combined therapy. Select these separately on the electrotherapy and on the ultrasound units. **Set the electrotherapy unit to CV mode.** Then attach the respective electrode to the patient to close the electric circuit ultrasound head-patient-electrode (see the above diagrams). It is now possible to run the ultrasound by the **start /stop1** key. Position the ultrasound head in contact with tissue and notice that the timer commences counting down. Slowly increase the intensity on the electrotherapy by turning the **select / intensity** knob to the right (in the "+" direction). Combined therapy is now running. If the contact between the ultrasound head and the treated tissue during the therapy was not continuous, the times shown on both devices can differ, because timer countdown on the ultrasound device does not run when the contact is interrupted.

2.11.5 STOPPING COMBINED THERAPY IN INDIVIDUAL DEVICES

Delivery of combined therapy ends after expiration of the set time on both units' timer devices. To stop or interrupt therapy before the set time expires, it is necessary first to interrupt the therapy on both units by pressing the **start / stop** keys.



3 DEVICE MENU

Press the **menu** (11) key - two options appear, **menu** and **user**. Enter the **menu** option and scroll through the following options:

- accessories
- encyclopaedia – see chapter **Encyclopaedia**
- unit settings
- special settings

3.1 ACCESSORIES

The available options are:

- installation of accessories
- information about connected accessories
- information about the number of patients and connection of connectors on the rear panel of the device

3.1.1 INSTALLATION OF ACCESSORIES

Each connected accessory has a memory that includes identification data of this accessory. According to these data, the unit recognizes which accessory is connected, if it is compatible or not and if the unit can work with the connected accessory or not. The memory also contains the serial number of the accessory. Since the accessory memory contains quite a lot of information, their upload lasts approximately from 30 second to 2 minutes. The installation of accessories serves for faster functioning of the unit. After the installation, only the serial number of the accessory is read from the accessory memory and the other information is read from the unit's memory.

During the installation process, follow the instructions on the screen. In particular:

- switch off all therapies
- do not have connected other accessories than the one that is being installed. Make sure the installed accessory is connected directly, not via interface cable and vacuum or BTL-4000 Sono devices.

This will help decrease electromagnetic interference, which could cause improper reading of memory data.

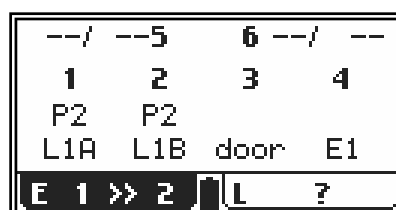
3.1.2 INFORMATION ABOUT ACCESSORIES

Allows identification of connected accessories (name, serial number, for which generator - output / input - the accessory has been designed).



3.1.3 CONNECTORS – INFORMATION

This menu item will inform you about the way of connection of the connectors on the rear panel of the device and up to how many patients you can connect safely to the device.



3.2 UNIT SETTINGS

This submenu provide a list of settings of parameters and user preferences:

- **Access Password setting**
- **Sound setting**
- **Auto-switch off setting**
- **Setting of display contrast**
- **Setting of contrast on small (digital) 99 display**
- **Setting of display backlight**
- **Date and time setting**
- **Language setting**
- **Setting of HW key**
- **New operation**
- **Style of operation**
- **Unit Information**
- **Unlock code**
- **Service functions**

3.2.1 PASSWORD SETTING

This option enables the change of the password, which is required by the device after switch-on. Without entering of this password the device does not allow any further work the password required to operate the unit after power-up. The units as standard come with this function disabled.

If the unit includes a laser generator - **BTL-4000 Laser, BTL-48xx L, BTL-48xx xL**, you cannot disable the password code (in compliance with the applicable standards). In this case, the four-digit code is factory-set to **0000**.

Note:

If you happen to forget the password, you can always use the universal one: "00000000"

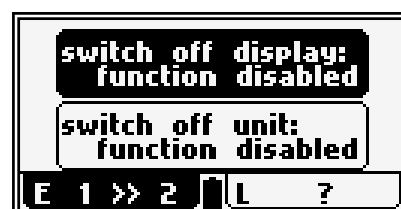
3.2.2 SOUND SETTING

Sets audio signalling of keys and provides warnings of various operational conditions (start of therapy, stop or pause of therapy). The factory-set **standard sounds** are sounds of therapy processes. You can set another sound scheme or switch the sounds completely off (**sound scheme 0**)..

Units with laser generator - **BTL-4000 Laser, BTL-48xx L, BTL-48xx xL**, the sound signalling of running therapy can be enabled or disabled from the menu (press **menu** key (**11**), select **menu – specific settings – sound in running therapy**)

3.2.3 AUTO SWITCH OFF SETTING

Here you can set the time after which the display will be switched off, and the idle time after which to switch off the entire device.



3.2.4 SETTING OF DISPLAY CONTRAST

After selection of this menu you can set the optimum contrast (readability) of the display by the **select/intensity** knob (12).

Since the display contrast depends on many factors (e.g. temperature of the display), there is also another fast and direct way of setting the contrast. Press simultaneously the **enter** (13) and **esc** (14) keys and set the contrast by the **select/intensity** knob (12) (when holding the two keys **enter** and **esc** pressed).

3.2.5 SETTING CONTRAST OF SMALL DISPLAY

After selection of this menu you can set the optimum contrast (readability) of the lower digital display on the front panel by the **select/intensity** knob (12).

3.2.6 SETTING OF BACKLIGHT

In this item you can select by the **select/intensity** knob (12) whether the main display shall be backlighted permanently, shall not be backlighted at all or shall be backlighted only if the device is connected to the mains. This setting has strong influence on the time for which the device can be supplied from the accumulators* without recharging. The switched-on backlighting is considerable load for the accumulators* and reduce the time of operation without recharging.

*) refers only to the devices of the Professional series.

3.2.7 DATE AND TIME SETTING

Sets the date and time.

3.2.8 LANGUAGE SETTING

Selects the language of the text on the display of the device. Factory pre-set is **English**.

3.2.9 SETTING OF HW KEY

Via this option the type of unit can be changed by inserting a special 64-digit code.

3.2.10 NEW OPERATION

In older devices the **enter** and **esc** keys were arranged the other way round; in this item you can select the new arrangement (**enter** on the right, **esc** on the left) or the old arrangement (**enter** on the left, **esc** on the right).

3.2.11 STYLE OF OPERATION

Here you can select whether the set time and intensity values on the display after the end of therapy shall be zero or equal to the values of the last performed therapy.

3.2.12 UNIT INFORMATION

Displays info about the unit (serial number, firmware version, etc.). It also contains information till when the device will work – so called "device validity". If the functioning of the device is temporary, this item contains information until which date the device will be fully functional.

3.2.13 UNLOCK CODE

If the functioning of the device is temporary, in this item can be inserted the code which can prolong the functionality of the unit or removes the time restriction.



3.2.14 SERVICE FUNCTIONS

- **SCAN DISK**

Checks the file system in the unit for possible errors. Recommended for use in case of lack of memory, if the unit refuses to save data, or if you think that some data have been lost.

- **FILE SYSTEM FORMATTING**

Clears all data and programs created by the user.

- **DELETE ACCESSORIES**

Deletes all installed accessories. Use only in case of improper installation – e.g. a bad "scattered" picture on the tab, connected accessories are not detected (the "?" symbol is displayed), etc.

- **DRIVES INFO**

Displays the current free space in the memory that can be used for user data. User data are, for example saved user diagnoses, I/t curves, etc.

The user can use the memory marked "E."; the memory marked "S:" and "L:" are intended for internal use.

- **DEFAULT SETTING WITHOUT LOSING USER DATA**

This option is available in the subscreen, which could be accessed by pressing the **next** key from the "service functions" submenu. All factory settings are restored. User data, such as user saved therapies, sequences etc. are preserved.

- **GENERS INFO**

This option also is available in the subscreen, which could be accessed by pressing the **next** key from the "service functions" submenu. It shows information about the generators in the unit - their type, ID, FW version, position (master or slave) and temperature.

3.3 SPECIAL SETTINGS

Variable for each generator. See your User's Guide for details.



4 USER SETTINGS OPTION

Press **menu**, select the **user settings** option - opens a screen allowing access to special features of the unit, as well as to data saved by the user. The following items can be selected:

- user sequences
- user diagnoses / programs
- recent therapies
- motor point detection*
- accommodation coefficient*
- I/t curve*

* Available only with electrical stimulator equipped with electrodiagnostics (optional).

4.1 USER SEQUENCES

This item enables to work with the list of sequences of programs created by the user. The selected sequence can be run, edited and deleted in this menu. A new sequence can be created in the therapy parameters screen in the manual settings.



4.1.1 CREATING NEW SEQUENCE

There is limitation of the choice of currents in one sequence when there is no pause set between the sections:

If the option **pause between sections** is set, the unit stops generation after each current and the intensity of the next current has to be set manually. In this case, there is no limitation and the user can select and combine any current in one sequence. We suggest setting this option for electrotherapy sequences.

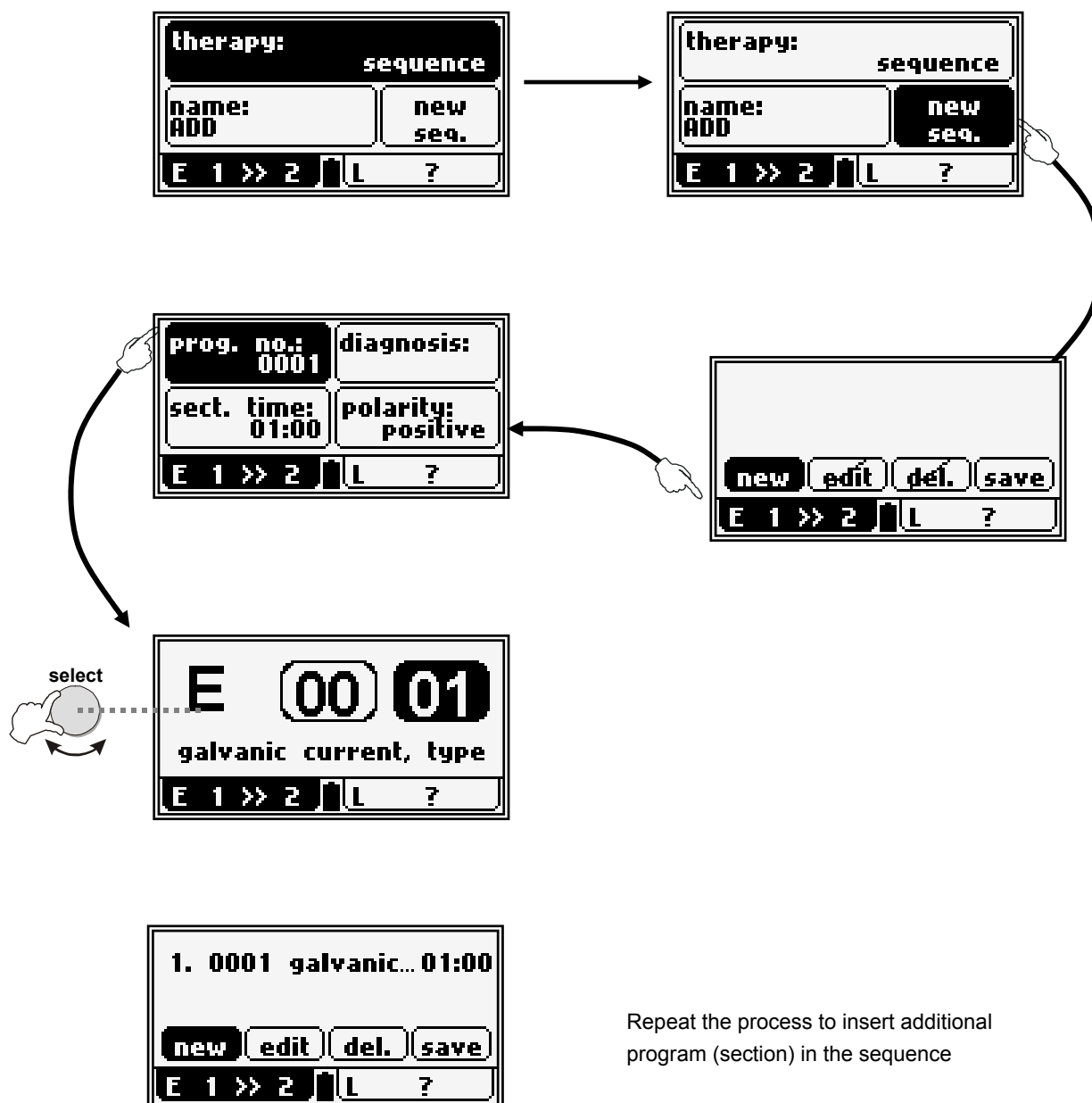
If the pause between sections is not set, the unit generates the same intensity for all currents. Be careful when setting sequences. Each current is felt differently by the patient. Whereas in case of TENS the patient tolerates an intensity of about 100 mA, the maximum tolerated intensity in case of diadynamic currents is 10 times lower. Combine in one sequence only currents that are perceived by the patient in a similar way – such as currents with the same pulse length and with maximum difference in frequency 1:10. Monophasic, symmetric and alternating currents should not be mutually combined.

The following combinations are recommended if the pause between sections is not set:

- diadynamic currents
- monophasic pulses of the same length with DC component (differing in frequency or modulation)
- symmetric pulses of the same length with zero DC component (differing in frequency or modulation)
- alternating pulses of the same length with zero DC component (differing in frequency or modulation)
- mid-frequency bipolar currents (differing in frequency or modulation)
- interferences
- TENS (differing in frequency or modulation)
- ultrasound therapies
- laser therapies



For the electro generator it is possible to select **sequence** in the therapy parameters screen (in the manual mode). For the laser generator, **laser sequence** is in the **therapy** parameter screen, accessible by means of the **next** key (from the manual mode). Creation of a new sequence for the electro generator is displayed in the following diagram.



4.1.2 PARAMETERS OF SECTIONS IN SEQUENCE

A sequence consists of a few currents / programs that are called sections. Parameters of sections must be set when creating a sequence.

Each program includes basic current parameters such as frequency, pulse length, modulation, etc. For more information, please refer to the chapter **Save Therapy**. Set all data in the manual setting screen and save them as a user-designed program (diagnosis). Insert the program/diagnoses in the sequence. Set the length of time of the section when inserting the program/diagnoses in the sequence (except laser, where the time of the section depends on the currently connected laser probe). Obviously, the factory-preset programs can also be inserted in the sequences. In the section only the polarity can be set (for electrotherapy sequence). The other parameters must be specified and saved in the inserted program.

Example: you want to create a sequence of diadynamic DF current (without base, positive polarity, CC mode, time of stimulation: 1 minute) and CP-ISO current (base 10%, reversal of polarity in the middle of the set time, CC mode, 10 minutes). Press **man** to select the manual mode, set diadynamic currents, DF type, without base, positive polarity, CC mode. Save this setting as (for example) program E-8001. Then set the parameters of the CP-ISO current: base 10%, positive, reversal, CC mode, and save it as (for example) program E-8002. Select therapy and press **new sequence** then press **new**, set the program number **8001**, set the time of section **1:00**, positive polarity, and press **enter**. Then add the second section in the same way – **new**, program number **8002**, time of section **10:00**, positive polarity with reversal, and press **enter**. Then press **enter** again to return to the manual settings screen, press **save/copy** and save the sequence (for example, as number 9501). The cv/cc mode is set globally for the whole sequence before starting it.

4.1.3 SAVING NEW SEQUENCE

Sequence created according to the chapter **Creating New Sequences** can be saved as follows:

Either directly from the screen for setting of new sections.



Or from the main manual screen in the same way as the new diagnosis.



User-made sequences are saved under numbers **9500 - 9999**. They can be found in the list of programs, in the list of diagnoses or in the list of sequences.



4.2 USER DIAGNOSES / PROGRAMS

Use this feature to run user designed therapies, to edit and delete their parameters and names. It is very similar to the creation of a new diagnosis / program – see the chapter **Therapy Saving**. On each channel tab, you can see only those therapies that were created on this tab. An icon before the name of the therapy will tell you which type of generator the therapy has been designed for.



4.3 LIST OF RECENT THERAPIES

Allows the user to select a recent therapy on the selected tab, run it again after pressing the **load** button or view its parameters.



5 ACCESSORIES

The equipment is not designed for use in connection with other medical devices except those stated in this manual.

Following is a list of accessories that can be supplied with the units, both standard and optional. For detailed information on individual accessories, see the enclosed leaflet and/or the **User's manual**.

5.1 POWER SUPPLY ADAPTER 60W / ADAPTER 90W

The devices of the BTL-4000 series can be connected to the mains exclusively via the supplied power supply Adapter 60W or Adapter 90W. Adapter 90W is more powerful and is used only for the connection of specific device configurations. Your device always includes the proper type of adapter.

It is forbidden to connect another adapter than mentioned to the device.

5.2 ACCUMULATOR

BTL-4000 devices have a built-in accumulator. Its type is specified in the chapter **Technical Parameters**. Replacement of the accumulator is provided by the authorized service of BTL devices.

During operation, the accumulator is continuously being recharged from the mains. Its recharging and keeping charged is running even if the equipment is switched off and connected to the mains, and the **mains switch (18)** on the rear panel is in position I. At switching off, the device checks the status of the accumulators and if it finds them low, it switches to the charging mode; in the charging mode the display is dark and the main display shows the symbol of a recharging battery. After recharging of the accumulator, the device automatically switches off completely. Note that the charging process runs only if the device is plugged into the mains and the rocker **mains switch (18)** on the rear panel is in position I.

Determination of the accumulator status may take some time, therefore, the device may respond with a delay after switching off and then on again.



If the device is supplied from the mains, this status is signalled by the plug picture. In case the device is supplied from the mains and the accumulator is low, there is shown an animation of a recharging battery on the display.



For full charging of the accumulator, let it recharge for approximately 6 hours – preferably overnight. A charged accumulator is signalled by a "full battery" picture.



If the accumulator is low, it is still possible to work with the device for a short time. But when the picture of a low accumulator starts to blink, the accumulator is dead and no therapy can be started, the running therapy will be finished and the device will switch off automatically.

To ensure long lifetime of the accumulator, we recommend keeping it permanently charged. When possible, connect the device to the mains via the adapter and switch the **mains switch (14)** to position I. The indication of recharging is displayed, after recharging it goes out and the accumulator will automatically be kept charged.

If the device is left unplugged from the mains for a longer time (even in the OFF status), the accumulators gradually spontaneously discharge. This effect is characteristic of the accumulators and cannot be removed; therefore, if the device has been off and unplugged for a longer time than approximately 2-3 months, we recommend recharging it, preferably for 48 hours without interruption.

For the same reason, we recommend charging the device continuously for at least 48 hours immediately after purchase, regardless of the accumulator status indication (you can work with the device normally, only do not unplug it from the adapter, the accumulator recharges even during standard operation of the device). Thus the accumulator becomes “formatted” and will keep working longer without recharging.

5.3 LITHIUM BATTERY

The device contains a lithium battery for backing up the date and time. The type of battery is stated in the chapter **Technical Parameters**. Replacement is provided by the authorized service of BTL devices.

5.4 ACCESSORIES COMMON FOR ALL UNITS

- External power supply Adapter 60W / Adapter 90W including the mains cable
- User's manual
- Markers for output cables
- Trolley

5.5 ACCESSORIES FOR ELECTROTHERAPY

- user's guide for electrotherapy
- patient cable BTL-236-1
- patient cable BTL-236-2 (optional)
- flat rubber electrodes 7 x 5 cm²
- flat rubber electrodes 12 x 8 cm²
- sponge covers 7 x 5 cm²
- sponge covers 12 x 8 cm²
- set of fixation belts
- point electrode (optional)
 - ball point attachment – diameter 2 mm
 - ball point attachment – diameter 6 mm
 - HVT attachment
- self-adhesive electrodes (optional)
- vaginal electrode (optional)
- rectal electrode (optional)
- interface cable between BTL-4000 and BTL vac (optional)

5.6 ACCESSORIES FOR ULTRASOUND THERAPY

- user's guide for ultrasound therapy
- 1cm² ultrasound head BTL-237-1-13 for 1 and 3MHz, ERA 0.7 cm² (optional)
- 4cm² ultrasound head BTL-237-4-13 for 1 and 3MHz, ERA 3.24 cm²
- ultrasound gel 235ml, 5l, 10l
- interface cable between BTL-46xx Puls and BTL-47xx Sono (optional)

5.7 ACCESSORIES FOR LASER THERAPY

- user's guide for laser therapy
- laser probes - red BTL-448
- laser probes – infrared BTL-448
- laser clusters - red BTL-445
- laser clusters - infrared BTL-445
- laser clusters - combined (red and infrared) BTL-445
- holder for laser probe and laser cluster
- holder for optical attachment
- optical attachments for laser probes
- warning labels
- safety goggles OPTE BS 2, L3, 630 – 1350nm

5.8 ACCESSORIES FOR MAGNETOTHERAPY

- user's guide for magnetotherapy
- disc applicator - BTL-239-1
- solenoid small applicator - BTL-239-2
- solenoid big applicator - BTL-239-3
- double disc applicator - BTL-239-4
- multi disc applicator - BTL-239-5
- linear applicator - BTL-239-6
- solenoid applicator ø70cm with couch- BTL-239-8
- interface cable for connection of old type of applicators from BTL-09
- fixation belts

6 MAINTENANCE AND SAFETY INSTRUCTIONS

The service inspection including measuring of all parameters of the device and possible recalibration must be performed at intervals shorter than 30 months. The inspection and recalibration is performed by the authorized BTL service department on the basis of the user's order. If the inspection is not done within the stated term, the manufacturer does not guarantee the technical parameters or safe operation of the product.

Safe operation of any item of medical equipment requires close attention to detail. Please check the following on a regular basis:

Power cord and plug: Check for frays and kinks. Ensure that the insulation is not damaged in any way.

Ultrasound head surface: Gel should always be thoroughly cleaned from the surface of the head. Always maintain this surface in as clean a condition as possible. Do not use any abrasive products for cleaning this surface as they could damage this delicate accessory.

Wires, cables and electrodes: Check for frays, cuts or tears in the insulation. Always route electrical cords and cables away from user or patient foot traffic areas where they could increase the chance of a tripping-related accident.

Check the unit before each use to determine that all controls function normally.

Calibration of heads and probes / clusters must be done by authorized personnel.

Cleaning

To keep the device clean, do not store or use it in a dusty environment and do not spill any liquid on the surface. To clean, turn the equipment off and unplug the power supply. Clean the unit with a damp cloth. Do not use abrasive materials. Do not use agents containing alcohol, ammonia, benzene, or thinners. Clean the accessories that come into contact with the patient after each treatment. Use appropriate agents. No part of the equipment needs to be aseptic or sterilized.

Laser probes/clusters: Keep the lens clean. After each application, wipe the head of the probe with a cotton cloth (divergent probes). Unscrew the head, wipe the lens and blow compressed air through the head (convergent probes). In laser clusters, wipe the laser aperture with a cotton cloth so as to keep the protective glass clean.

Laser optical attachments: Can be sterilized for 20 minutes at a temperature of 180°C.

Fuse replacement

A protective fuse is located inside the BTL-4000 device. The type of fuse is specified in the chapter **Technical Parameters**. The user should not replace the fuse; for replacement of the fuse, always contact the authorized service of BTL devices.

Transport and Storage

We recommend keeping the original packaging of this equipment to ensure its maximum protection during transportation. Unplug the power supply adapter and the accessories cables. The equipment must be stored or transported as defined in the chapter **Technical Parameters**.

6.1 SAFETY

ATTENTION!



The consumed current or voltage of the connectors marked with this label can exceed safety values.

The protection of the equipment is BF-type floating applied part (only if original accessories including power supply Adapter 60W / Adapter 90W are used).

The equipment does not use any medicaments which would be an integral part or would be applied by means of it.

ATTENTION!

This system has no user-serviceable parts or assemblies. Do not remove the instrument covers under any circumstances. Call your distributor for advice about any malfunction.

The device is equipped with a protection system that prevents connection of accessories other than those supplied from the manufacturer.



General safety precautions:

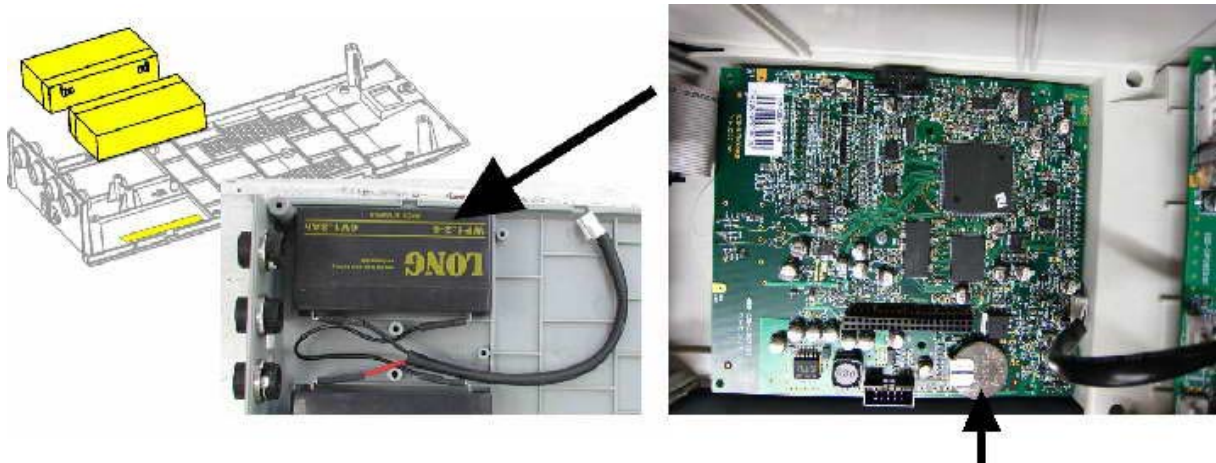
- Before first switch-on of the equipment, carefully read the User's Manual.
- All staff who will use the equipment must be instructed in the way of operation, maintenance and checking of the equipment, and the safety principles.
- The electrical cabling which the equipment will be connected to must be installed and tested according to the existing valid standards (IEC 364). If you are not sure that the mains are completely OK, get them inspected by an inspection engineer.
- Check whether the parameters of the mains correspond to the requirements of the equipment according to the chapter **Technical Parameters**. It must not be used in an environment which implies the danger of explosion or penetration of water into the equipment. It must not be used in connection with flammable anaesthetics or oxidizing gasses (O₂, N₂O, etc.).
- Do not place the equipment in direct sunshine or strong electromagnetic fields so as to prevent undesirable mutual influence. In case this undesirable influence occurs, place the equipment further from the source of interference or contact the authorized service of BTL devices.
- Inspect the equipment thoroughly before each use (loose cables, broken insulation of cables, functions of displays and controls, etc.); in case of any inconsistency, stop using the equipment and contact the authorized BTL service department. If the equipment's behaviour differs from the function described in this Manual, stop using the equipment and contact the BTL service department.
- If the equipment shows any defect or if you have doubts about its correct functioning, terminate therapy immediately. If you do not determine the source of uncertainty after thorough study of the Manual, contact the BTL service department. If the equipment is not used in accord with this Manual or is used even if it shows functional differences from this Manual, the user is responsible for the damage caused by the equipment.
- Do not dismantle the equipment in any case; removal of the protective covers implies the danger of electrical injury. Replacement of the lithium battery, fuses or accumulators may only be done by the authorized BTL service department.

- All material and parts which come into direct contact with the patient's body (as well as, for example, agents for cleaning the electrodes) must comply with the respective standards related to irritability, allergization, toxicity, genotoxicity, carcinogenicity (ISO 10993-1, ISO 10993-3, ISO 10993-5). The user is responsible for all these materials and parts if not supplied by the BTL equipment supplier.
- The connectors for accessories as well as the other connectors must not be used for connection of anything else than they are designed for, otherwise there is a danger of electrical injury and serious damage to the equipment.
- The equipment does not use or produce any toxic substances during its operation, storage or transport under the stated conditions.
- After bringing the equipment from a cold environment into warmth, do not plug it into the mains until the temperatures become equal (i.e. for at least 1 hour).
- Before the start of therapy, check whether all set parameters correspond to your intents.
- Do not apply therapy on damaged skin!
- To terminate the application, do not switch off the mains switch but press the **stop** knob (20). The time interval between switching the mains switch on and off must be at least 3 seconds.
- If after many years of operation it is necessary to discard the equipment, it can be done in a way which is usual for this type of devices after removal of the lithium battery and the lead accumulator. The removed batteries shall be disposed of in the way designated for hazardous waste - not within municipal waste. The equipment does not contain any toxic materials which could harm the environment in case of normal liquidation.

Warning: removal of batteries causes irreversible damage to the unit. Perform only environmental liquidation of the unit!

Procedure:- unscrew the bottom cover of the unit

- remove the batteries with a suitable tool (placing of batteries - see the picture)



The equipment and the accessories must not be used in a way not stated in this User's Manual.

During work with this device, use the recommended protective equipment.

- Keep the equipment out of reach of children.
- The equipment does not contain any components which can be repaired by the user. Do not remove any covers from the equipment. All repairs should be done by the authorized BTL service department.
- Don't connect equipment to the patient when it is still connected to the computer (via service connector).



Safety precautions for electrotherapy:

- When applying DC currents (the **polarity** button is enabled), it is necessary to pay attention to the set intensity and time of application of currents. Wrong values can cause burning of the patient's skin.
- The maximum secure effective value of current density on the electrodes is 2 mA/cm² (according to IEC 601-2-10). BTL-4000 Series can exceed this value (according to the place of used electrodes type). In such case it is necessary to pay greater attention to the application of currents! Wrong values can cause burning of the patient's skin.
- Application of electrodes near the thorax may increase the risk of cardiac fibrillation.
- For contraindications, see the chapter **Contraindications**. Use of electrotherapy in cases of contraindication must be approved by a specialist.
- Simultaneous connection of the patient to a high-frequency surgical device may cause burning in the place of the electrodes and possible damage to the electrotherapy device.
- Simultaneous connection of the patient to an ECG monitor or an ECG alarm system may cause temporary malfunctioning of the ECG systems or unreliability of the values measured by the ECG systems.
- Operation of the equipment close to (within 1 m of) a short-wave or micro-wave therapeutic device may cause instability of the equipment's output.
- All supplied electrodes can be used at the maximum intensity of currents and voltage that can be set on the device.



Safety precautions for ultrasound:

- Protect the heads consistently from shocks and frost. Do not unnecessarily bend the mains cable.
- **During therapy, hold the head so that you do not touch its metallic parts.**
- An impact on the metal part of the head as well as an intense impact on the head's case may negatively change the parameters of the therapeutic head.
- For contraindications, see chapter the **Contraindications**. Use of ultrasound therapy in cases of contraindication must be approved by a specialist.
- For therapy, use only the BTL ultrasound gel; the head is not tested for other gels or oils and their use could damage the head. If you still want to use other gels, we recommend them to be only water-based gels. Never use paraffin-based gels.



Safety precautions for laser:

- Mark the laser workplace with the respective warning notices and connect the door switch.
- Equip the laser workplace with an operating code which must be approved by a competent health officer.
- When using a laser probe with an output of 200 mW or more (300 mW, 400 mW) and if the laser power is set higher than 150 mW, the duration of therapy must not exceed 15 min.
- Attention – use of any other than the stated control and setting elements and processes may cause dangerous exposure to radiation.
- The equipment works with laser beam of the 3B class. When working with the beam, follow all the instructions stated in this Manual and in the laser therapy User's Guide. Prevent the laser beam from hitting the eyes, thyroid and other endocrine glands, the head, etc. (see the User's Guide). Both the therapist and the patient must wear the supplied protective goggles during therapy. Incorrect handling of the equipment (not in accord with this Manual) may cause dangerous radiation and even damage to the eyes! In such a case, the user is responsible for all damage.
- During radiation, do not disconnect the probe from the equipment and do not switch the equipment off.
- **Protect the laser probe consistently from impacts!!!! The probe is not waterproof!**
- **Protect yourself and your surroundings from being directly hit by the laser beam.**
- For contraindications, see the chapter **Contraindications**. Use of laser therapy in cases of contraindication must be approved by a specialist.



Safety precautions for magnet:

- Never use damaged applicators. Electric shock to personal or patient may occur.
- Attending personnel should keep away from the patient applicator side when the applicator is in use. The relevant channel should be switched off during necessary manipulation.
- Stop the therapy at once in case of any failure.
- Check all parameters before you start the therapy.
- Place the instrument on an even hard board to assure proper cooling.
- Watches, electronic devices and magnetic recording carriers can be damaged when closely exposed to applicators and cables.
- Do not connect anything else to the connectors – there is a danger of injury by electric shock and / or serious damage to the instrument.
- The instrument must not be used in the presence of pregnant women!



6.2 CONTRAINDICATIONS

The list of contraindications the cases when the manufacturer does not recommend applying the selected therapy. If a specialised medical workplace decides to apply the therapy in spite of it, they bear all the responsibility for this action.

6.2.1 CONTRAINDICATIONS FOR ELECTROTHERAPY

- Active tuberculosis
- Allergy to solutions used for dampening electrode cover sponges
- Applications in the area of the heart and eyes
- Groundless stimulation - "placebo effect"
- Cardiovascular diseases
- Electronic implants (i.e. Cochlear implants, neural implants, pacemaker, defibrillator, chip implants...)
- Metal implants
- Malignancies in the current path
- Skin defects and skin inflammations
- Bleeding conditions
- Menstruation
- Tumour diseases
- Sensitivity disorders (relative KI) in the area of electrode placement
- Psychopathological syndromes and organic psychosyndromes
- Multiple sclerosis
- Pregnancy
- Inflammations of veins and lymphatic paths



6.2.2 CONTRAINDICATIONS FOR ULTRASOUND

- Active tuberculosis
- Allergies to used ultrasound gels
- Applications on peripheral nerves (located on the bone, close to skin surface)
- Applications on glands with inner secretion
- Applications on areas around the eyes, brain, spinal cord
- Blood diseases
- Children - epiphyses of growing bones
- Gonads
- Pregnancy
- Pacemaker
- Cardiovascular diseases
- Cochlear implants
- Metal implants
- Skin defects and skin inflammations
- Bleeding conditions
- Menstruation
- Tumour diseases
- Blood circulation deficiency
- St. p. Laminectomii

6.2.3 CONTRAINDICATIONS FOR LASER THERAPY

- Applications in the area of the eyes – possibility of direct eye irradiation and retina damage
- Menstruation
- Tumour diseases
- Irradiation of malignancies and potentially precancerous growths
- Irradiation of patients with cochlear implants
- Irradiation of glands with inner secretion
- Patients with febrile conditions
- Pulse modes (both red and infrared beam) are not used on patients with anamnesis of epilepsy
- Pregnancy



6.2.4 CONTRAINDICATIONS FOR MAGNETOTHERAPY

- Bleeding conditions, hypothalamus and hypophysis disorders
- Electronic implants (i.e. Cochlear implants, neural implants, pacemaker, defibrillator, chip implants...)
- Hyperthyroidism, hyperfunction of adrenals, myasthenia gravis
- Malignancies
- Menstruation
- Metal implants
- Onychomycosis
- Paroxysm neurologic diseases
- Pregnancy
- Psychoses
- Serious mycosis, active tuberculosis, acute virosis
- Special attention must be paid to patients with hypotonia or otherwise with hypertension
- Tumour diseases
- Children – growth discs of bones (epiphysis)

6.3 WARRANTY

The Manufacturer of this product guarantees the product is free of defects in workmanship and material for the period and conditions defined in the BTL General Service Conditions.

7 TECHNICAL PARAMETERS

7.1 TECHNICAL PARAMETERS OF THE BTL-4000 SERIES DEVICES

Device Type:	BTL-4000 Series – physiotherapy
Display:	LCD
•dimensions:	diagonal: 10.922 cm (4.3")
•resolution:	480 x 272
Low battery indication:	on the display
Design	
Weight – device only	2.9 kg
Dimensions (l x h x w)	160 x 140 x 350mm
Covering grade according to EN 60 529	
Operating conditions:	
Temperature:	+ 10 °C to + 40 °C
Relative humidity:	30 % to 75 %
Atmospheric pressure	700 hPa to 1060 hPa
Position	horizontal – on legs
Type of operation	continuous
Transport and storage conditions:	
Temperature:	- 10 °C to + 55 °C
Relative humidity:	25 % to 85 %
Atmospheric pressure	650 hPa to 1100 hPa
Position	any
Max time of storage:	max. 1 year
Additional conditions:	transport only in the supplied packing recharge the accumulators at least 2x a year
Power supply:	supply only via the external supply Adapter 60W / Adapter 90W
Input max:	60 W / 90 W
Input voltage	24 V DC
Frequency:	50 Hz to 60 Hz
Protection class:	II (according to IEC 536, ČSN 33 0600)
Internal fuse:	T6.3A / 250V, safety fuse on the printed circuit, acc. to IEC 127-2 (replacement may only be done by the authorized service)
Mains switch:	on the rear panel of the device, positions 0 and I
Power switch	on the front panel of the device, marked on/off
Covering:	IP20
Internal chemical sources:	
Battery:	lithium battery CR2032
Lead accumulator:	2x 6 V / 1.2 Ah, maintenance-free
capacity of the accumulator:	20 min. – 45 min. in dependence on the energy intensiveness of the therapies applied*
charger:	internal, time needed for 100 % charging is approx. 6 hours
Classification	
Applied parts type	BF
Class according to MDD 93/42/EEC	IIb

*the stated values do not apply to Magnet therapy, which always must be supplied from the AC mains.

Therapy duration

For electro and laser therapies

0 to 100 minutes

For ultrasound therapies

0 to 30 minutes

For magnetotherapies

0 to 100 minutes

Step of setting

1 second

Accuracy of therapy time

± 2 % of the set value

Accuracy of time values

5 seconds per day

7.2 TECHNICAL PARAMETERS OF POWER SUPPLY ADAPTER 60W / ADAPTER 90W

Device Type:	Adapter 60W	Adapter 90W
Operating conditions:		
Temperature:	+ 10 °C to + 40 °C	
Relative humidity:	30 % to 75 %	
Atmospheric pressure	700 hPa to 1060 hPa	
Position	horizontal	
Type of operation	continuous, use indoor only	
Transport and storage conditions:		
Temperature:	- 10 °C to + 55 °C	
Relative humidity:	25 % to 85 %	
Atmospheric pressure	650 hPa to 1100 hPa	
Position	any	
Time of storage:	max. 5 years	
Power supply of the device:		
Maximum input:	100 W	120 W
Input mains voltage	100V – 240V ~ (alternating)	
Frequency:	50 – 60 Hz	
Protection class:	II (according to IEC 536, ČSN 33 0600)	
Fuse:	internal	
Covering:	IP20	
Type of connector of the device	mini 2 poles	
Output parameters:		
Output voltage	24V	
Output current	2.5A	3.75A
Output power:	60W	90W
Insulation barriers:		
Mains – output (output connector)	4kV	

7.3 BASIC PARAMETERS OF ELECTROTHERAPY GENERATOR

Output current*	max. 140 mA (maximum instantaneous value)
Output current - HVT**	max. 4 A (maximum instantaneous value)
Output current - microcurrents**	max. 999 μ A (maximum instantaneous value)
Output voltage	max. 130 V (maximum instantaneous value)
Output voltage - HVT**	max. 390 V (maximum instantaneous value)
*maximum value for some currents is limited according to IEC 601-2-10	
**presence of these currents depends on the ordered configuration of the device	
Tolerance of output amplitude	$\pm 10\%$ for 5 mA (5 V, 5 μ A) and higher; otherwise $\pm 30\%$ $\pm 10\%$ for 35 V and higher; otherwise $\pm 30\%$ (for HVT)
Tolerance of time parameters of current	standard $\pm 5\%$; maximum $\pm 15\%$ standard $\pm 20\%$ for modulation of HVT from 5 s; otherwise $\pm 30\%$
Nominal load impedance	500 Ω
Internal output resistance in CV mode	96 $\Omega \pm 10\%$
Internal output resistance in CC mode	47 k $\Omega \pm 10\%$
Output capacity	standard 150 pF
Output polarity – can be selected	positive / negative / with reversal in the middle of therapy
Positive polarity	red banana plug = + = anode; black banana plug = - = cathode
Negative polarity	red banana plug = - = cathode; black banana plug = + = anode

7.4 BASIC PARAMETERS OF ULTRASOUND GENERATOR

Adjustable values

Effective intensity	
Continuous operation	0.1 to 2 W/cm ² $\pm 20\%$ for output intensity higher than 0.2W/cm ²
Pulse operation	0.1 to 3 W/cm ² $\pm 20\%$ for output intensity higher than 0.2W/cm ²
Working frequency	1 MHz $\pm 5\%$ and 3.2 MHz $\pm 5\%$
Modulation frequency	10 to 150 Hz $\pm 5\%$
Duty factor	6 to 100 % $\pm 5\%$ of the set value
Duty factor – default	6.25 % (1:16); 12.5 % (1:8); 25 % (1:4); 50 % (1:2); 100% (1:1) $\pm 5\%$ of the set value
Maximum output power	12W

Parameters of pulses

Duty factor	Frequency 10 Hz period 100 ms		Frequency 50 Hz period 20 ms		Frequency 100Hz period 10 ms		Frequency 150 Hz period 6.67 ms	
	Pulse length	Pause length	Pulse length	Pause length	Pulse length	Pause length	Pulse length	Pause length
50 %	50 ms	50 ms	10 ms	10 ms	5 ms	5 ms	3.33 ms	3.33 ms
25%	25 ms	75 ms	5 ms	15 ms	2.5 ms	7.5 ms	1.67 ms	5 ms
10%	10 ms	90 ms	2 ms	18 ms	1 ms	9 ms	0.67 ms	6 ms
6%	6 ms	94 ms	1.2 ms	18.8 ms	0.6 ms	9.4 ms	0.40 ms	6.27 ms

Steps of adjustable values

Intensity	0.1 W/cm ²
Modulation frequency	10 Hz
Duty factor	1%

7.5 BASIC PARAMETERS OF LASER GENERATOR

Indication of emission of laser radiation	green pilot light on the probe, supplementary lighting of the probe/cluster, sound
Indication of readiness for emission	on the screen
Indication of not being ready for emission	on the screen
Additional safety means	- warning labels on the device case and on the probe/cluster - warning label for the entrance door of the workplace - connector of the remote control

Connector of the remote control (door switch)

input voltage	AC / DC 5 V to 35 V (external power supply) / automatic polarity recognition
input current	max. 10mA
active level	settable positive / negative logic

Adjustable values

Frequency***	0 – 10000 Hz with laser probe BTL-448 0 – 500 Hz with laser cluster BTL-445
accuracy of frequency	± 3 % of the stated value
Dose*	0.1 – 100.0 J/cm ²
accuracy of dose	±20% (according to IEC 60601-2-22)
Area*	0.1 – 100.0 cm ²
accuracy of area	see BNR
Output*	5.0 – 500 mW (depending on the connected laser probe) 20 – 1800 mW (depending on the connected laser cluster)
accuracy of output	±20% (according to IEC 60601-2-22)
Duty factor**	10 – 90 %
accuracy of duty factor	±1% of the range of DF

*) The stated values are maximum. The actual values depend on the type of connected laser generator and on the ordered configuration of the device

**) Can be set only in pulsed mode, in continuous mode it is always 100%

***) Zero frequency means continuous operation

7.6 BASIC PARAMETERS OF MAGNET GENERATOR

Adjustable values

Magnetic field	max. 128 mT / 1280 Gauss* (max. value on the surface of applicator)
Mode of magnetic field	pulses / series of pulses / continuous
Shape of magnetic pulses	rectangular, rectangular protracted, exponential, triangular, sinusoidal
Pulse frequency	0 – 166 Hz
Modulation	none, burst, sine / trapezoid / symmetric surge
Random frequency	yes / no
Accuracy:	
amplitude of magnetic field	±30%
time parameters	±10%

*) The stated value is maximum for disk applicator. The actual value depends on the type of connected applicator and on the settings of the device.

7.7 TECHNICAL PARAMETERS OF ULTRASOUND HEADS

BTL-237-1-13 – small head

Effective radiation area (ERA)	
ERA (EN 61689)	$0.7 \text{ cm}^2 \pm 20\%$
ERA (21 CFR 1050)	$0.9 \text{ cm}^2 \pm 20\%$
Maximum effective intensity	$3 \text{ W/cm}^2 \pm 20\%$
Maximum effective acoustic power	$2.1 \text{ W} \pm 20\%$
Radiation frequency	1 MHz and 3.2 MHz $\pm 5\%$
Type of beam	collimated
BNR	< 8
Covering grade according to EN 60 529	IP 67

BTL-237-4-13 – large head

Effective radiation area (ERA)	
ERA (EN 61689)	$3.2 \text{ cm}^2 \pm 20\%$
ERA (21 CFR 1050)	$4.4 \text{ cm}^2 \pm 20\%$
Maximum effective intensity	$3 \text{ W/cm}^2 \pm 20\%$
Maximum effective acoustic power	$9.6 \text{ W} \pm 20\%$
Radiation frequency	1 MHz and 3.2 MHz $\pm 5\%$
Type of beam	collimated
BNR	< 8
Covering grade according to EN 60 529	IP 67

7.8 TECHNICAL PARAMETERS OF LASER PROBES

Laser probes with red (visible) radiation:

Type:	BTL-448-03RD	BTL-448-03RC	BTL-448-05RD	BTL-448-05RC
Output power:	30 mW $\pm 20\%$	30 mW $\pm 20\%$	50 mW $\pm 20\%$	50 mW $\pm 20\%$
Wavelength:	685 nm	685 nm	685 nm	685 nm
Class*:	3B	3B	3B	3B
Beam:	divergent	collimated	divergent	collimated
Aperture:	Ø 2 mm	Ø 4.4 mm	Ø 2 mm	Ø 4.4 mm
BNR:	0.28 rad ± 0.05 rad	0.015 rad ± 0.005 rad	0.28 rad ± 0.05 rad	0.015 rad ± 0.005 rad
NOHD**:	0.2 m	2.3 m	0.2 m	3.4 m

Laser probes with infrared (invisible) radiation:

Type:	BTL-448-05IC	BTL-448-10IC	BTL-448-20IC	BTL-448-30IC
Output power:	50 mW $\pm 20\%$	100 mW $\pm 20\%$	200 mW $\pm 20\%$	300 mW $\pm 20\%$
Wavelength:	830 nm	830 nm	830 nm	830 nm
Class*:	3B	3B	3B	3B
Beam:	collimated	collimated	collimated	collimated
Aperture:	Ø 4.4 mm	Ø 4.4 mm	Ø 4.4 mm	Ø 4.4 mm
BNR:	0.015 rad ± 0.005 rad	0.015 rad ± 0.005 rad	0.015 rad ± 0.005 rad	0.015 rad ± 0.005 rad
NOHD**:	8.5 m	12.1 m	12.5 m	16.6 m

Type:	BTL-448-40IC
Output power:	400 mW \pm 20 %
Wavelength:	830 nm
Class*:	3B
Beam:	collimated
Aperture:	\varnothing 4.4 mm
BNR:	0.015 rad \pm 0.005 rad
NOHD**:	19.2 m

* Laser class is classified according to IEC 60601-2-22:1995 and IEC 60825-1:1993/A2:2001.

**NOHD – nominal ocular hazard distance (nominal distance from the laser aperture in which eye damage by laser beam should not happen)

7.9 TECHNICAL PARAMETERS OF LASER CLUSTERS

Laser clusters with red (visible) radiation:

Type:	445-C25R02
Output power:	200 mW \pm 20 % (4x 50 mW)
Wavelength:	4x 685 nm
Class*:	3B
Beam:	4x divergent
Aperture:	4x \varnothing 1.5 mm
Active area:	\varnothing 56 mm (25 cm ²)
BNR:	4x 0.35 rad \pm 0.05 rad
NOHD**:	0.2 m

Laser clusters with infrared (invisible) radiation:

Type:	445-C25I08	445-C25I16
Output power:	800 mW \pm 20 % (4x 200 mW)	1600 mW \pm 20 % (4x 400 mW)
Wavelength:	4x 830 nm	4x 830 nm
Class*:	3B	3B
Beam:	4x divergent	4x divergent
Aperture:	4x \varnothing 3.5 mm	4x \varnothing 3.5 mm
Active area:	\varnothing 56 mm (25 cm ²)	\varnothing 56 mm (25 cm ²)
BNR:	4x 0.52 rad \pm 0.17 rad	4x 0.52 rad \pm 0.17 rad
NOHD**:	8.5 m	12.1 m

Combined laser clusters with red and infrared radiation:

Type:	445-C25RI10	445-C25RI18
Output power:	red: 200 mW \pm 20 % (4x 50 mW) infrared: 800 mW \pm 20 % (4x 200 mW)	red: 200 mW \pm 20 % (4x 50 mW) infrared: 1600 mW \pm 20 % (4x 400 mW)
Wavelength:	red: 4x 685 nm infrared: 4x 830 nm	red: 4x 685 nm infrared: 4x 830 nm
Class*:	3B	3B
Beam:	8x divergent	8x divergent
Aperture:	red: 4x \varnothing 1.5 mm infrared: 4x \varnothing 3.5 mm	red: 4x \varnothing 1.5 mm infrared: 4x \varnothing 3.5 mm
Active area:	\varnothing 56 mm (25 cm ²)	\varnothing 56 mm (25 cm ²)
BNR:	red: 4x 0.35 rad \pm 0.05 rad infrared: 4x 0.52 rad \pm 0.17 rad	red: 4x 0.35 rad \pm 0.05 rad infrared: 4x 0.52 rad \pm 0.17 rad
NOHD**:	8.5 m	12.1 m

* Laser class is classified according to IEC 60601-2-22:1995 and IEC 60825-1:1993/A2:2001.

**NOHD – nominal ocular hazard distance (nominal distance from the laser aperture in which eye damage by laser beam should not happen).

7.10 TECHNICAL PARAMETERS OF MAGNETIC APPLICATORS

Type	Name	Dimension [mm]	Weight [kg]	Max. intensity
BTL-239-1	disk	130 x 130 x 30	1.05	128.0 mT (1280 G)
BTL-239-2	solenoid 30	340 x 340 x 300	5.75	9.0 mT (90 G)
BTL-239-3	solenoid 60	620 x 540 x 300	10.00	8.5 mT (85 G)
BTL-239-4	double disk	2x 130 x 130 x 30	2.15	95.0 mT (950 G)
BTL-239-5	multi disk	4x 130 x 130 x 30	4.30	75.0 mT (750 G)
BTL-239-6	linear	290 x 600 x 30	6.05	46.4 mT (464 G)
BTL-239-8	solenoid 70 with couch	2000x740x1100	67.00	7.6 mT (76 G)

These mentioned parameters for applicators are basic. The exact values and shape of the magnetic field – please see 2nd part of manual – BTL-4000 Magnetotherapy User's Guide.

7.11 APPLICABLE STANDARDS

Name	IEC, EN, ISO, MDD
Medical electrical equipment. Part 1: General requirements for safety	IEC 601-1
Amendments to IEC 601-1	A2, A11, A12
Medical electrical equipment Part 1: General requirements for safety 1.Collateral standard: Safety requirements for medical electrical systems	IEC 60601-1-1
Medical electrical equipment Part 1: General requirements for safety 2. Collateral Standard: Electromagnetic compatibility. Requirements and tests	IEC 60601-1-2
Industrial, scientific and medical (ISM) radio-frequency equipment - Radio disturbance characteristics - Limits and methods of measurement	EN 55011
Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 2: Electrostatic discharge immunity test - Basic EMC Publication	IEC 61000-4-2
Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio frequency, electromagnetic field immunity test	IEC 61000-4-3
Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transients/burst immunity test - Basic EMC Publication	IEC 61000-4-4
Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 5: Surge immunity test	IEC 61000-4-5
Medical electrical equipment Part 1: General requirements for safety 4.Collateral standard: Programmable electrical medical systems	IEC 601-1-4
Medical devices – Risk analysis	EN 1441 / ISO 14971
Biological evaluation of medical devices - Part 1: Evaluation and testing	ISO 10 993-1
The Medical Devices Directive 93/42/EEC	MDD 93/42/EEC
Medical electrical equipment Part 2: Particular requirements for the safety of ultrasonic therapy equipment	IEC 601-2-5
Medical electrical equipment - Part 2: Particular requirements for the safety of nerve and muscle stimulators	IEC 601-2-10
Medical electrical equipment Part 2: Particular requirements for the safety of diagnostic and therapeutic laser equipment	IEC 601-2-22
Safety of laser products. Part 1: Equipment classification, requirements and user's guide	IEC 60 825-1
Amendments to IEC 60 825-1	A1, A2

7.12 INTERCONNECTION OF DEVICES

BTL-4000 Puls can be interconnected with: BTL vac, BTL-4000 Sono, BTL-12, BTL-07p, BTL-4000 Sono, BTL-5000 Sono

BTL-4000 Combi can be interconnected with: BTL vac, BTL-12

BTL-4000 Sono can be interconnected with: BTL-4000 Puls, BTL-4000 Puls, BTL-5000 Sono

Other combinations are not allowed.

7.13 MANUFACTURER

This product is manufactured in accordance with the EU Medical Devices Directive by:

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8 UNITS CONFIGURATIONS

8.1 TABLE OF CONFIGURATIONS OF THE COMBINED DEVICES BTL 4000 SERIES

Type:	4810S Professional	4810L Professional	4800SL Professional	4810S Optimal	4810L Optimal	4800SL Optimal
mains supply	x	x	x	x	x	x
built-in accumulator	x	x	x			
manual mode	x	x	x	x	x	x
predefined programs	x	x	x	x	x	x
predefined diagnoses	x	x	x	0	0	0
user programs	50	50	50	5	5	5
ultrasound head 1MHz				x		x
ultrasound head 1/3MHz	x		x			
el. patient cables – basic				x	x	
el. p. cab. with visual detection	x	x				
possibility to connect BTL-vac	x	x		x	x	
electrotherapies	1	1		1	1	
ultrasound therapies	1		1	1		1
magnetic therapies						
laser therapies		1	1		1	1
number of simultaneously running therapies	2	2	2	1	1	1
number of simultaneously running electrotherapies	1	1		1	1	
number of simultaneously running magnetotherapies						
number of simultaneously connected magnetic applicators						
sound schemes	x	x	x	x	x	x
number of simultaneously treated patients	2	2	2	1	1	1

Type:	4815S Professional	4815L Professional	4815S Optimal	4815L Optimal
mains supply	x	x	x	x
built-in accumulator	x	x		
manual mode	x	x	x	x
predefined programs	x	x	x	x
predefined diagnoses	x	x	0	0
user programs	50	50	5	5
ultrasound head 1MHz			x	
ultrasound head 1/3MHz	x			
el. patient cables – basic			x	x
el. p. cab. with visual detection	x	x		
possibility to connect BTL-vac	x	x	x	x
electrotherapies	1	1	1	1
ultrasound therapies	1		1	
magnetic therapies				
laser therapies		1		1
number of simultaneously running therapies	2	2	1	1
number of simultaneously running electrotherapies	1	1	1	1
number of simultaneously running magnetotherapies				
number of simultaneously connected magnetic applicators				
sound schemes	x	x	x	x
number of simultaneously treated patients	2	2	1	1

Type:	481xM Professional	4800LM Professional	4800SM Professional	481xM Optimal	4800LM Optimal	4800SM Optimal
mains supply	x	x	x	x	x	x
built-in accumulator	x	x	x			
manual mode	x	x	x	x	x	x
predefined programs	x	x	x	x	x	x
predefined diagnoses	x	x	x	0	0	0
user programs	50	50	50	5	5	5
ultrasound head 1MHz						x
ultrasound head 1/3MHz			x			
el. patient cables – basic				x		
el. p. cab. with visual detection	x					
possibility to connect BTL-vac electrotherapies	x			x		
ultrasound therapies	1			1		
laser therapies		1			1	
magnetic therapies	1	1	1	1	1	1
number of simultaneously running therapies	2	2	2	1	1	1
number of simultaneously running electrotherapies.		1	1		1	1
number of simultaneously running magnetotherapies	1	1	1	1	1	1
number of simultaneously connected magnetic applicators	2	2	2	2	2	2
sound schemes	x	x	x	x	x	x
number of simultaneously treated patients	2	2	2	1	1	1

Type:	4816S Professional	4816L Professional	4816M Professional	4818S Optimal	4818L Optimal	4818M Optimal
mains supply	x	x	x	x	x	x
built-in accumulator	x	x	x	x	x	x
manual mode	x	x	x	x	x	x
predefined programs	x	x	x	x	x	x
predefined diagnoses	x	x	x	x	x	x
user programs	50	50	50	50	50	50
ultrasound head 1MHz						
ultrasound head 1/3MHz	x			x		
el. patient cables – basic						
el. p. cab. with visual detection	x	x	x	x	x	x
possibility to connect BTL-vac electrotherapies	x	x	x	x	x	x
ultrasound therapies	1	1	1	1	1	1
laser therapies	1			1		
magnetic therapies		1			1	
number of simultaneously running therapies	2	2	2	1	1	1
number of simultaneously running electrotherapies.	1	1	1	1	1	1
number of simultaneously running magnetotherapies			1			1
number of simultaneously connected magnetic applicators			2			2
sound schemes	x	x	x	x	x	x
number of simultaneously treated patients	2	2	2	1	1	1

Type:	4810T Professional	4815T Professional	4800TL Professional	4810T Optimal	4815T Optimal	4800TL Optimal
mains supply	x	x	x	x	x	x
built-in accumulator	x	x	x			
manual mode	x	x	x	x	x	x
predefined programs	x	x	x	x	x	x
predefined diagnoses	x	x	x	0	0	0
user programs	50	50	50	5	5	5
ultrasound head 2MHz	x	x	x	x		x
el. patient cables – basic				x	x	
el. p. cab. with visual detection	x	x				
possibility to connect BTL-vac	x	x		x	x	
electrotherapies	1	1		1	1	
ultrasound therapies	1	1	1	1	1	1
magnetic therapies						
laser therapies			1			1
number of simultaneously running therapies	2	2	2	1	1	1
number of simultaneously running electrotherapies	1	1		1	1	
number of simultaneously running magnetotherapies						
number of simultaneously connected magnetic applicators						
sound schemes	x	x	x	x	x	x
number of simultaneously treated patients	2	2	2	1	1	1

8.2 TABLE OF CONFIGURATIONS OF THE ELECTROTHERAPY DEVICES BTL-4000 PULS

Type:	4610 Professional	4615 Professional	4620 Professional	4625 Professional	4610 Optimal	4615 Optimal	4620 Optimal	4625 Optimal
mains supply	x	x	x	x	x	x	x	x
built-in accumulator	x	x	x	x				
manual mode	x	x	x	x	x	x	x	x
pre-defined programs	x	x	x	x	x	x	x	x
pre-defined diagnoses	x	x	x	x	o	x	o	o
user programs	50	50	50	50	5	5	5	5
ultrasound head 1MHz								
ultrasound head 1/3MHz								
el. patient cables – basic					x	x	x	x
el. p. cab. with visual detection	x	x	x	x				
possibility to connect BTL-vac	x	x	x	x	x	x	x	x
electrotherapy outputs	1	1	2	2	1	1	2	2
ultrasound outputs								
laser outputs								
number of simultaneously running therapies	1	1	2	2	1	1	2	2
number of simultaneously running electrotherapies.	1	1	2	2	1	1	1	1
sound schemes	x	x	x	x	x	x	x	x
number of simultaneously treated patients	1	1	2	2	1	1	1	1
galvan	x	x	x	x	x	x	x	x
tråbert, farad, neofarad	x	x	x	x	x	x	x	x
diadynamics	x	x	x	x	x	x	x	x
TENS	x	x	x	x	x	x	x	x
rectangular pulses	x	x	x	x		x		x
triangular pulses	x	x	x	x		x		x
exponential pulses	x	x	x	x		x		x
combined pulses	x	x	x	x		x		x
intermittent pulses								
stimulation pulses	x	x	x	x		x		x
russian stimulation	x	x	x	x	x	x	x	x
2-pole interference	x	x	x	x	x	x	x	x
4-pole interference			x	x			x	x
isoplanar field (interference)				x				x
vector field (interference)				x				x
HVT	o	o						
h – waves		x		x				
spastic currents								
micro currents		x		x				
leduc current		x		x				
mid-frequency waves								
pulses with exponential rise	x	x	x	x		x		x
preset sequences		20	20	20		5	5	5
electrodiagnostics								

8.3 TABLE OF CONFIGURATIONS OF THE ULTRASOUND THERAPY DEVICES BTL-4000 SONO

Type:	4710 Professional	4710 Optimal	4210 Professional	4210 Optimal
mains supply	x	x	x	x
built-in accumulator	x		x	
manual mode	x	x	x	x
number of ultrasound therapies	1	1	1	1
user programs	50	5	50	5
predefined diagnoses	x	o	x	o
preset programs	x	x	x	x
language versions	x	x	x	x
sound schemes	x	x	x	x
recent therapies	20	20	20	20
Ultrasound parameters:				
head 1 MHz		x		
head 1 and 3 MHz	x			
head 2 MHz			x	x
detection of contact	continuous	continuous	continuous	continuous
continuous mode of operation	x	x	x	x
pulse mode of operation	x	x	x	x
duty factor	x	x	x	x

8.4 TABLE OF CONFIGURATIONS OF THE LASER THERAPY DEVICES BTL-4000 LASER

Type:	4110 Professional	4110 Optimal
mains supply	x	x
built-in accumulator	x	
manual mode	x	x
number of laser therapies	1	1
user programs	50	5
predefined diagnoses	x	o
preset programs	x	x
language versions	x	x
sound schemes	x	x
recent therapies	20	20

8.5 TABLE OF CONFIGURATIONS OF THE MAGNETOTHERAPY DEVICES BTL-4000 MAGNET

Type:	4920 Professional	4920 Optimal
mains supply	x	x
built-in accumulator	x	
manual mode	x	x
number of magnetotherapies	1	1
user programs	50	5
predefined diagnoses	x	o
preset programs	x	x
language versions	x	x
sound schemes	x	x
recent therapies	20	20
number of simultaneously running magnetotherapies	2	2
number of simultaneously connected magnetic applicators	2	2
Magnetic parameters:		
Rectangular pulses	x	x
Rectangular protracted	x	x
Exponential	x	x
Triangular	x	x
Sinusoidal	x	x
Continuous mag. field	x	x
Series of pulses	x	x
Random frequency	x	x
Modulation	x	x